5-B-16

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CIRCUIT DESCRIPTION

TRANSMITTER DESCRIPTION

The transmitter, unit 1 of the test set, generates sine waves of various frequencies and amplitudes within the audio spectrum. Fold out the unit 1 transmitter chassis schematic diagram (8420-223 SHT 1 of 2) The sine waves are generated on the transmitter 1A1 MAIN BOARD. The output frequency is manually voltage controlled by FREQUENCY dial potentiometer 1R1, or automatically by the sweeping voltage from pin E of the 1A3 SWEEP GENERATOR BOARD. The main board accepts the frequency control voltage for developing the sine waves, the amplitudes of which are determined by the various front panel pushbutton settings and transmit level selections. The transmit level selections tap off appropriate voltages on the 1A2 ATTENUATOR BOARD. When the front panel HOLDING COIL switch is set to IN, holding coil 1L1 is connected across output connectors J6 and J7 to maintain the necessary current load on the transmission line for simulating an off-hook condition. Each circuit board and the battery assembly are further described in the following paragraphs.

1A1 Transmitter Main Board Circuits

The 1A1 board contains the circuits for sine wave generation and the switches for the various front panel pushbuttons. Fold out the 1A1 transmitter main board schematic diagram (D420-214). The heart of the main board is a triangle and square wave generator circuit. The sine waves are shaped from the triangle waves. The triangle waves are developed by capacitor-charging ramps that are alternately reversed in polarity. The polarity reversal is caused by a flip-flop circuit that in turn produces square waves. The flip-flop, or HYSTERESIS SWITCH circuit, changes states upon detecting amplitude limits at the THRESHOLD NETWORK of the charging ramps from the TRIANGLE WAVE GENERATOR circuit.

The frequency of the triangle waves, as well as the sine waves, is determined by the amount of charging current to timing capacitors C8, C9, and C10 in the triangle wave generator circuit. The TRIANGLE RAMP INPUT circuit supplies the appropriate polarity of charging current to the timing capacitors. Current is alternately switched from charging through Q1 to reverse charging through Q2 with each alternation of the hysteresis switch square wave at the junction of diodes CR2 and CR3. The amount of charging current determining the frequency is provided by the VCO AMPLIFIER circuit. Control voltage from either the FREQUENCY dial or the 1A3 sweep board drives the VCO amplifier. The control voltage to the VCO amplifier is also sent to the 1A6 signal frequency suppression board through front panel switch 1S12.

The SINE CONVERTER circuit shapes the triangle wave into the sine wave. The sine wave is then available for attenuation in the various operating modes by the BUFFER AMPLIFIER circuit. The CAL mode switch settings present the sine wave directly to the OUTPUT AMPLIFIER circuit as do the IMPEDANCE MEASUREMENT switch settings Z X 1, Z X 2, Z X 5, and Z X 10. The TRAN LEVEL (transmit level) and RETURN LOSS settings route the sine wave through the 1A2 attenuator board FINE TRANSMIT LEVEL selector switch before the output amplifier, attenuating the sine wave in selectable 1 dBm steps down to −10 dBm.

The sine wave from the output amplifier circuit goes to transformer T1 for transformation from a one-line signal to a two-line balanced output. The CAL mode switch settings present the sine wave directly to transformer T1 as do the IMPEDANCE MEASUREMENT switch settings Z X 1, Z X 2, Z X 5, and Z X 10. The TRAN LEVEL and RETURN LOSS settings route the sine wave through the 1A2 attenuator board COARSE TRANSMIT LEVEL selector switch before transformer T1, attenuating the sine wave in selectable 10 dBm steps from +10 dBm down to −40 dBm.

The balanced two-line sine wave output from transformer T1 goes to the transmitter front panel output connectors and also through front panel connector J2 and the test set cable to the receiver. See Figure 4-1. The CAL and TRAN LEVEL switch settings route the balanced output directly to the front panel connectors. The IMPEDANCE MEASUREMENT switch settings Z X 1, Z X 2, Z X 5, and Z X 10 insert the necessary resistance into the line for their respective impedance levels.

Setting the RETURN LOSS mode switch converts the transmitter output network into a sensitive hybrid impedance bridge across which the balanced output from transformer T1 is connected (see Figure 4-1). The bridge, or hybrid, compares a transmission line under test with a standard compromise network of either 600Ω or 900Ω in series with a 2.15 μF capacitor, depending on the settings of the TRANSMIT IMPEDANCE pushbuttons

The circuit or line under test is connected to one side of the hybrid (the equivalent of the line connection of a hybrid coil) and is compared to a known value reference network (equivalent to the net connection of a hybrid coil) on the other side. The reference network can be either the internal compromise network or an external precision network depending on the shorting strap connection between J4 and J5, and the external connection to J3 and J4, respectively. The receiver is connected through the test set cable across

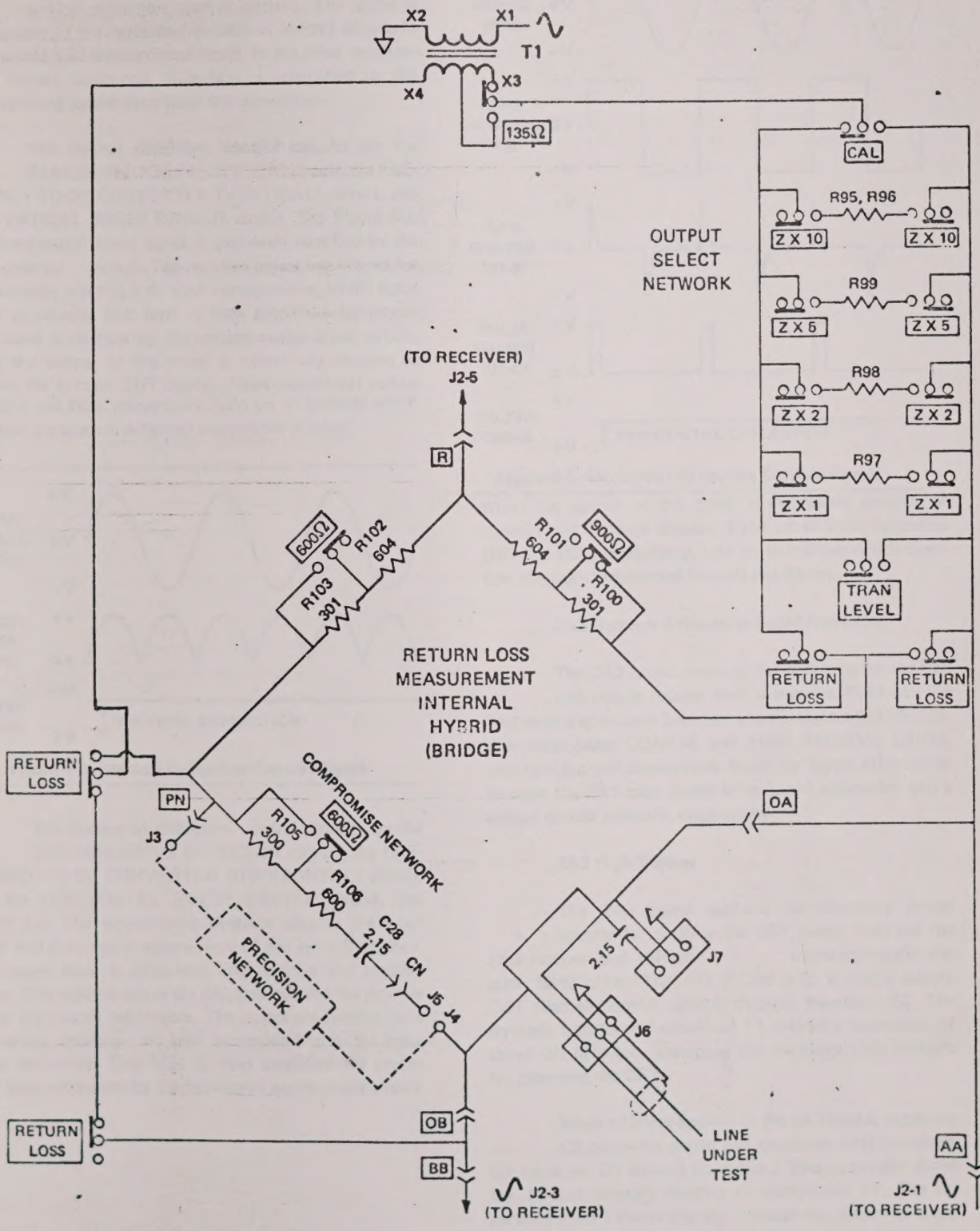


Figure 4-1. Transmitter Output Networks

The conditioned signal is then applied to the vertical deflection control circuits. The signal is also applied to the horizontal deflection control circuits in the received level measurement mode. In the other measurement modes, horizontal deflection is controlled by the synchronizing square wave from the transmitter.

The vertical deflection control circuits are the PEAK DETECTOR (RECTIFIER) circuit, the FREQUENCY-TO-DC CONVERTER (VERTICAL) circuit, and the VERTICAL SWEEP DRIVER circuit. See Figure 4-3. The conditioned input signal is positively rectified by the peak detector circuit. The rectified pulses are filtered for a dc average, creating a dc level corresponding to the input signal amplitude. This level is then amplified for proper CRT beam deflection by the vertical sweep driver circuit. When the output of the driver is excessively negative or positive for in-range CRT display, front panel limit indicators DS3 and DS4, respectively, turn on to indicate which direction the beam is deflected beyond the display.

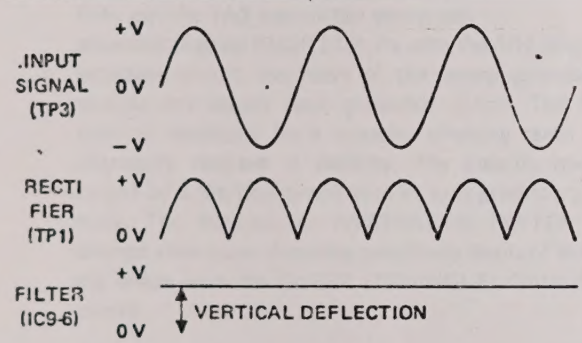


Figure 4-3. Vertical Deflection Control Signals

The horizontal deflection control circuits are the ZERO-CROSSING DETECTOR circuit, the FREQUENCY-TO-DC CONVERTER (HORIZONTAL) circuit, and the HORIZONTAL SWEEP DRIVER circuit. See Figure 4-4. The zero-crossing detector accepts the input signal and puts out a square wave of the same frequency. The square wave is integrated into positive and negative spikes. The negative spikes are dropped out and the positive spikes are shaped into pulses. The pulses are filtered for a dc average, creating a dc level corresponding to the input signal frequency. This level is then amplified for proper CRT beam deflection by the horizontal sweep driver circuit.

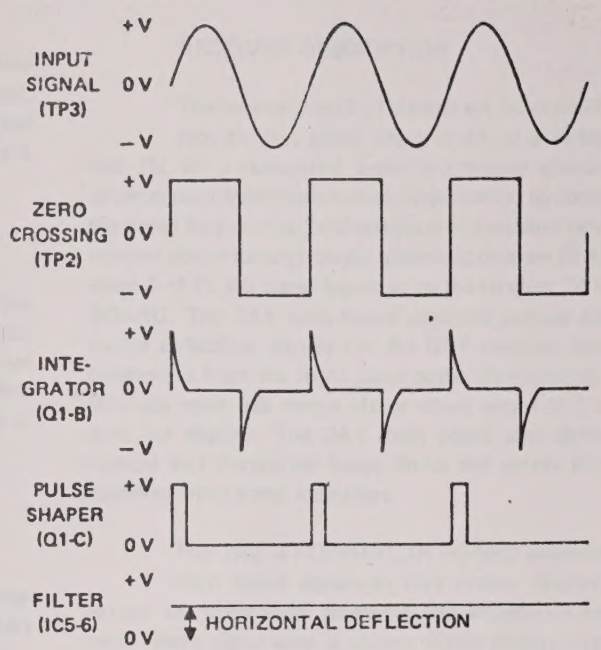


Figure 4-4. Horizontal Deflection Control Signals

When the output of the driver is excessively positive or negative for in-range display, front panel limit indicators DS5 and DS6, respectively, turn on to indicate which direction the beam is deflected beyond the display.

2A2 Receiver Attenuator Board Networks

The 2A2 board contains the networks for the fine and coarse receive level selections. Fold out the 2A2 receive attenuator board schematic diagram (D420-222). The front panel COARSE and FINE RECEIVE LEVEL selectors tap off appropriate levels for signal attenuation through the 2A1 main board in an L-pad attenuator and a voltage divider network, respectively.

2A3 High Voltage

The 2A3 board contains the necessary power circuits for creating the CRT beam. Fold out the 2A3 receiver high voltage board schematic diagram (D420-212). The +15 V and −15 V inputs supply CRT filament heater voltage through transistor Q2. The fly-back transformer circuit of T1 creates a resonation of about 20 kHz for developing the necessary high voltages for powering the CRT.

When +12 V is applied to the 2A3 board, capacitor C2 begins to charge and continues until transistor Q1 turns on. Q1 turning on causes a field to expand about the 16-turn primary winding of transformer T1. The expanding field induces current through the 4-turn primary winding, charging C2 negative until Q1 turns off. Q1 turning off causes the field about the 16-turn winding to collapse.

the hybrid to sense any level difference between the line under test and the reference network. In this arrangement, the receive level (between J2 pins 3 and 5) is subtracted algebraically from the transmit level (between J2 pins 1 and 3) to derive the amount of return loss.

1A2 Transmitter Attenuator Board Networks

The 1A2 board contains the networks for the fine and coarse transmit level selections. Fold out the 1A2 transmit attenuator board schematic diagram (D420-211). The front panel COARSE and FINE TRANSMIT LEVEL selectors each tap off appropriate levels in voltage divider networks.

1A3 Transmitter Sweep Generator

The 1A3 board contains the circuits for the frequency control voltage sweep, or ramp to the 1A1 transmitter main board input.
Fold out the 1A3 transmitter sweep gen
schematic diagram (D420 213). As with the 1A1 main board generator circuit, the heart of the sweep generator is a triangle and square wave generator circuit. The triangle wave is developed by a capacitor-charging ramp that is alternately reversed in polarity. The polarity reversal is caused by a flip-flop circuit that in turn produces a square wave. The flip-flop, or HYSTERESIS SWITCH circuit changes state upon detecting amplitude limits of the charging ramps from the SWEEP (TRIANGLE) GENERATOR circuit.

The frequency of the triangle wave sweep ramps is determined by the amount of charging current to C3 in the sweep generator circuit. The amount of charging current determining the frequency, and thus the sweep speed, is determined by the SWEEP SPEED potentiometer in line with the input to the sweep generator circuit. The sweep generator output is combined with an offset voltage from the SWEEP RANGE REFERENCE circuit at the input to the SWEEP OUTPUT BUFFER circuit. This ensures both the 5 kHz and 15 kHz sweep ranges to be in the same display range at the receiver. The sweep output buffer circuit provides the appropriate level of frequency control sweep voltage to the 1A1 main board input.

RECEIVER DESCRIPTION

The receiver, unit 2 of the test set, is an oscilloscope that displays either ohms or dB on a vertical scale and Hz on a horizontal scale to compare characteristic impedance or transmission level, respectively, to corresponding signal frequencies. Fold out the unit 2 receiver (and unit 3 receiver power supply) chassis schematic diagram (B 420-223 sheet 2 of 2). All signal inputs go to the receiver 2A1 MAIN BOARD. The 2A1 main board produces vertical and horizontal deflection signals for the CRT electron beam and determines from the front panel pushbutton settings which graticule scale (dB versus Hz or ohms versus Hz) is to be used for display. The 2A1 main board also detects the vertical and horizontal beam limits and drives the corresponding front panel indicators.

The 2A2 ATTENUATOR BOARD attenuates the main board signals to their proper display levels, except for calibration reference and impedance measurement where signal level is always within display range. The 2A3 HIGH VOLTAGE receives the front panel TRACE INTENSITY control voltage and provides the power for producing the electron beam in the CRT. . The 2A4 INTERFACE BOARD provides interconnection of the various supply and control voltages between the other boards and circuits in the receiver. The 2A5 CRT DISPLAY ASSEMBLY contains the cathode ray tube (CRT) for producing the display, the deflection yoke for controlling vertical and horizontal beam deflection, the front panel beam position indicators, and the two display scale graticules with their respective lamps. The front panel HOLDING COIL switch connects holding coil 2L2 across input connectors J11 and J12 to maintain the necessary current load on the transmission line for simulating an off-hook condition. Each circuit board aside from the 2A4 interface board and 2A5 CRT assembly is further described in the following paragraphs.

2A1 Receiver Main Board Circuits

The 2A1 board contains the circuits for receiving and controlling the display of signal inputs. Fold out the 2A1 receiver main board schematic diagram (D420-216 Transmission line signals are received through front panel connectors J11 and J12 into the INPUT IMPEDANCE TERMINATIONS network when measuring received levels. When receiving the calibration reference or measuring return loss or impedance, signals are received from the transmitter through the test set cable and front panel connector J1. The balanced two-line input signal is terminated according to the 600Ω, and 900Ω pushbutton settings and applied to transformer T1 for conversion to a one-line signal. The INPUT BUFFER AMPLIFIER circuit conditions the signal to the proper attenuation for display relative to the measurement mode pushbuttons and the attenuation controls in the 2A2 attenuator board.

The collapsing field induces current through the 4-turn winding to reverse, charging C2 positive again until Q1 turns back on. Q1 turning back on continues the resonation. The resonation frequency is set beyond the audio spectrum to avoid possible interference with test set operation (and possible audible annoyance to the test set operator). The secondary winding of transformer T1 is tapped to provide 3000 volts peak-to-peak and 200 volts peak-to-peak providing the +6000 V CRT plate voltage and +200 V cathode/grid voltages, respectively.

The 3000 V peak-to-peak alternating voltage of the transformer T1 secondary winding is referenced about zero volt (circuit common). This alternating voltage is applied to a voltage quadrupler network to produce the +6000 V CRT plate voltage. Capacitor C5 and diode CR4 clamp the alternating voltage above zero volt, creating a new positive-peak voltage of +3000 volts. The clamped alternating voltage is rectified by diode CR3 and capacitor C7, establishing a +3000 Vdc level. Capacitor C4 and diode CR2 clamp the alternating voltage from the secondary winding above the +3000 V level, creating a new positive peak voltage of +6000 volts. The clamped alternating voltage is rectified by diode CR1 and capacitor C6, establishing the +6000 V CRT plate voltage.

The 200 volts peak-to-peak is rectified and divided for biasing the CRT cathode and grids. The cathode bias, and thus beam intensity, is controlled by the front panel TRACE INTENSITY adjustment. The beam gets brighter as the cathode is biased closer to zero volt, further from the plate potential. Increasing the cathode bias positive, closer to the plate potential, dims the beam.

TROUBLESHOOTING

INTRODUCTION

This section provides the basic concepts and procedures for troubleshooting the test set. Proper calibration of the test set, if possible, is assumed to have been made before deciding the test set to be faulty. A description of the purpose of each major assembly and a collection of principle waveforms are included. This section supplements the schematic diagrams in this manual. This section is intended for service technicians and engineers acquainted with schematic diagram analysis and operation of the test set.

TROUBLESHOOTING

Troubleshooting the test set as with any instrument is an orderly process of first identifying the problem, then localizing the source of the problem to a major assembly, and finally isolating the source of the problem.

Localizing the Problem

Localizing a problem with test set operation requires an acquaintance with the purpose of each major assembly in the test set. The purpose of each major assembly is presented in Table 6-1. The malfunctioning or failure of any of the listed purposes localizes the trouble to the respective assembly.

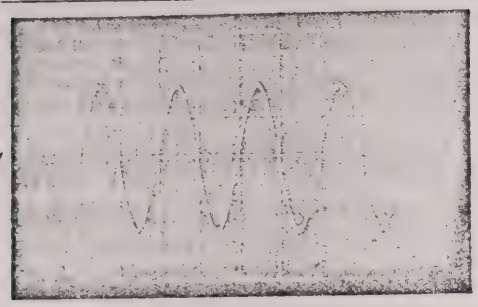
Table 6-1. PURPOSE OF MAJOR TEST SET ASSEMBLIES

Assembly		Purpose
1A1	Transmitter Main Board	Sine Wave Synthesis, Mode Determination, Output
1A2	Transmitter Attenuator Board	Transmit Level Mode Attenuation Control
1A3	Sweep Generator	Sweep Generation and Control,
1A4	Transmitter Battery Charging Board	Power Supply
2A1	Receiver Main Board	Input, Mode Determination, CRT Deflection Control
2A2	Receiver Attenuator Board	Receive Level Mode Attenuation Control
2A3	High Voltage	CRT Beam Development,
2A4	Interface Board	Internal Interconnection of Supply and Control Voltages
2A5	CRT Display	Signal Display
3A1	Receiver Battery Charger Board	Power Supply

Isolating the Problem

Isolating a problem in the test set requires a knowledge of functional block diagram and signal flow analysis. The schematic diagrams can be used as block diagrams for isolating the problem to a functional block. The following paragraphs supplement the schematic diagrams and discuss principle waveforms associated with major functional blocks. The waveforms correspond to a 1 kHz, 0 dBm signal set by the transmitter in the transmit and receive level modes with a transmit and receive impedance of 900Ω, unless otherwise specified. The waveforms are keyed in their figure captions with their respective schematic diagram and assembly drawing test points.

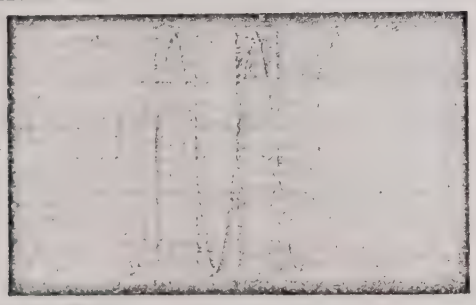
The appropriate level of the sine wave prior to fine attenuation (1 dBm steps) can be seen at (1A1) TP5 as shown in Figure 6-6.



0.5 V/CM
0.5 mSEC/CM

Figure 6-6. Fine Attenuation Input Waveform at (1A1) TP5

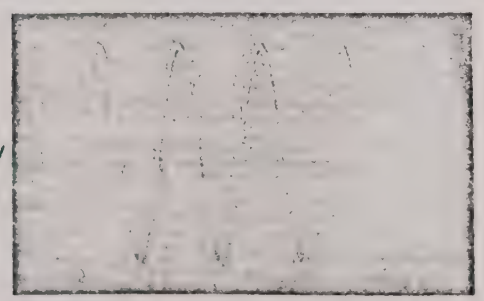
The appropriate level of the sine wave before transformation to a two-line signal and after coarse attenuation (10 dBm steps) can be seen at (1A1) TP6 as shown in Figure 6-7.



0.5 V/CM
0.5 mSEC/CM

Figure 6-7. Coarse Attenuation Output Waveform at (1A1) TP6

2A1 Receiver Main Board Waveforms

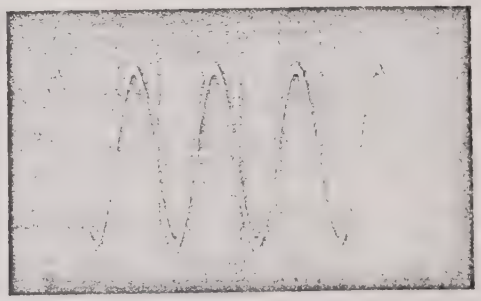


0.5 V/CM
0.5 mSEC/CM

Figure 6-8. Receive Level Attenuation Input Waveform at (2A1) TP5

The 2A1 board receives input signals and conditions them for display with appropriate horizontal and vertical CRT deflection. The appropriate level of the input signal prior to receive level attenuation can be seen at (2A1) TP5 as shown in Figure 6-8.

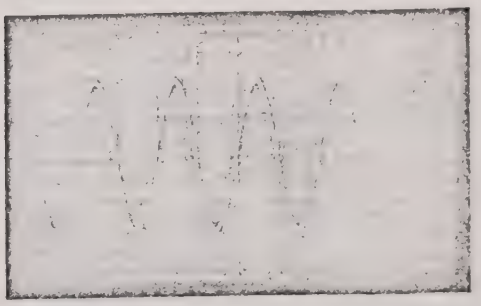
The appropriate level of the signal after receive level attenuation can be seen at (2A1) TP6 as shown in Figure 6-9.



20 mV/CM
0.5 mSEC/CM

Figure 6-9. Receive Level Attenuation Output Waveform at (2A1) TP6

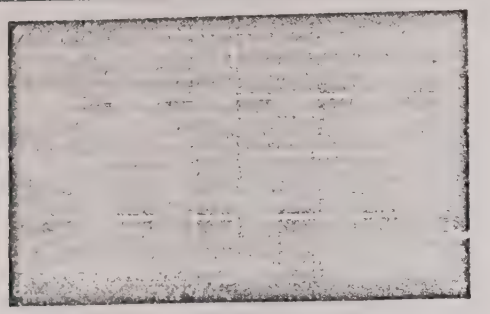
The signal is amplified and conditioned for CRT deflection control as seen at (2A1) TP3 and shown in Figure 6-10.



1 V/CM
0.5 mSEC/CM

Figure 6-10. Horizontal and Vertical Deflection Input Waveform at (2A1) TP3

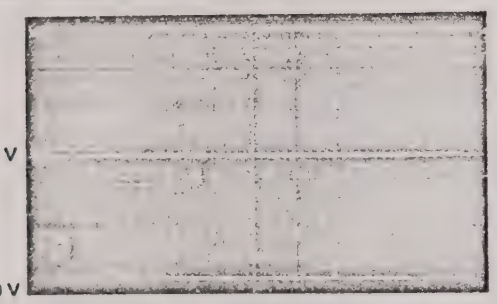
Horizontal deflection is derived by converting frequency to a representative voltage level. The first stage of conversion can be seen at the zero-crossing detector circuit (square wave) output at (2A1) TP2 as shown in Figure 6-11.



10 V/CM
0.5 mSEC/CM

Figure 6-11. Zero-Crossing Detector (Square Wave) Waveform at (2A1) TP2

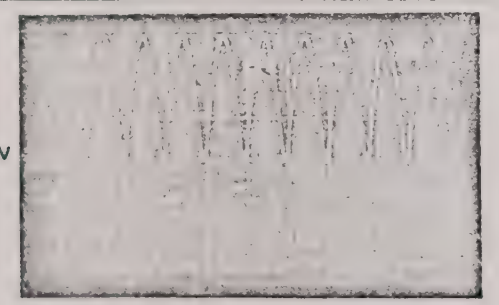
The square waves from the zero-crossing detector are differentiated and the positive edges converted into positive pulses at (2A1) TP7. Figure 6-12 shows these pulses relative to the waveform in Figure 6-11 in the top trace and in expanded detail in the bottom trace.



5 V/CM
Top Trace: 0.5 mSEC/CM
Bottom Trace: 5 μSEC/CM

Figure 6-12. Horizontal Frequency-To-DC Converter Input Waveform at (2A1) TP7

Vertical deflection is derived from converting the positively rectified average dc level of the signal to the appropriate level for the vertical deflection. The positively-rectified signal can be seen at (2A1) TP1 as shown in Figure 6-13.

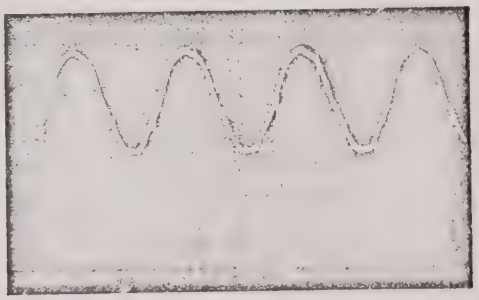


0.5 V/CM
0.5 mSEC/CM

Figure 6-13. Vertical Frequency-To-DC Converter Input Waveform at (2A1) TP1

2A3 High Voltage

The 2A3 board develops an oscillating voltage from +12 volts and transforms the oscillations into the high voltages necessary for CRT beam development. The primary oscillations prior to high voltage transformation can be seen at (2A3) TP1 as shown in Figure 6-14.

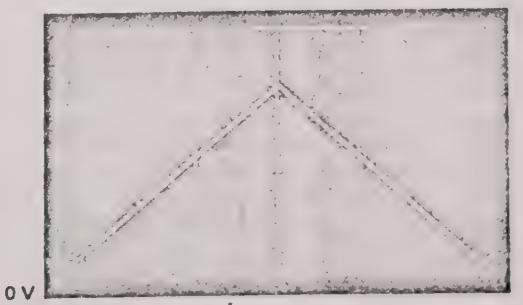


10 V/CM
20 μSEC/CM

Figure 6-14. CRT Beam Oscillation Source Waveform at (2A3) TP1

1A3 Sweep Generator

The sweep output circuits are operating normally if with the transmitter front panel SWEEP SPEED control fully clockwise the triangle wave shown in Figure 6-1 is observed at (1A3) TP1.

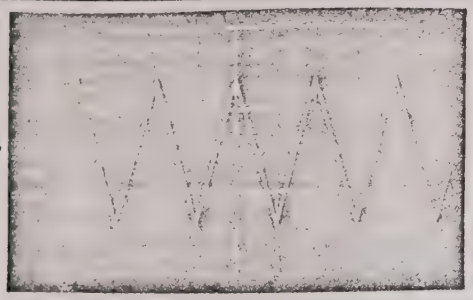


2 V/CM
0.2 SEC/CM
EXT SYNC ON 1A3-B

Figure 6-1. Sweep Generator Output Waveform at (1A3) TP1

1A1 Transmitter Main Board Waveforms

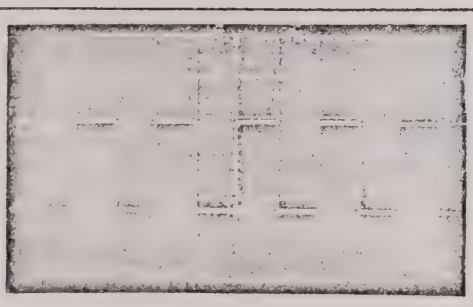
The 1A1 board shapes a sine wave from a triangle wave developed by the triangle wave generator circuit at (1A1) TP2 as shown in Figure 6-3.



1 V/CM
0.5 mSEC/CM

Figure 6-3. Triangle Wave Generator Waveform at (1A1) TP2

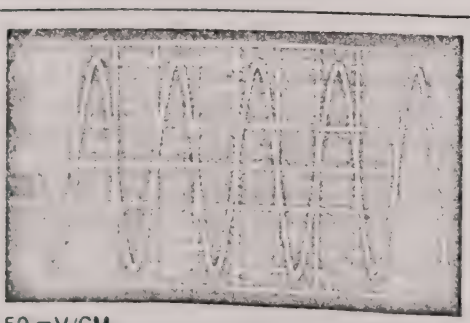
The square wave sync pulse developed by the hysteresis switch circuit at (1A1) TP3 should be as shown in Figure 6-4.



0.2 V/CM
0.5 mSEC/CM

Figure 6-4. Hysteresis Switch (Sync Pulse) Waveform at (1A1) TP3

The sine wave is developed by the sine converter circuit at (1A1) TP4 as shown in Figure 6-5.



50 mV/CM
0.5 mSEC/CM

Figure 6-5. Sine Converter Waveform at (1A1) TP4

PERFORMANCE VERIFICATION AND CALIBRATION

INTRODUCTION

This section provides the instructions for verifying and calibrating the performance of the Model 420 test set. Drawings showing the locations of the various calibration adjustments for the test set are located at the back of this section. These drawings may be folded out for reference while referring to the calibration procedures. The verification and calibration instructions are intended for qualified technicians and field engineers.

FACTORY REPAIR

Wavetek maintains a complete factory repair department for customer instruments. Customers not having the necessary personnel or test equipment may return their instruments to the factory for maintenance. A detailed description of specific problems should be attached to instruments being returned to minimize turnaround time for any calibration or repair.

PERFORMANCE VERIFICATION

Performance of the test set is correct when the expected result of each calibration adjustment is obtained. There is no need to remove the covers of the test set for any adjustment other than power supply unless the performance is found to be inaccurate or faulty.

CALIBRATION INSTRUCTIONS

The test set has 14 groups of calibrations involving 25 internal adjustments. These adjustments are initially factory set and sealed in position. The adjustments are located on seven of the ten printed circuit assemblies as shown on the two foldout drawings at the back of this section. The 25 calibration adjustments are listed in Table 5-1 in the sequence in which they should be made.

Table 5-1. MODEL 420 TEST SET CALIBRATION ADJUSTMENTS

Procedure	Calibration Sequence	Adjustment Sequence
5.6.1	Transmitter ZENER Current	(1A4) R4
5.6.2	Receiver ZENER CURRENT	(3A1) R4
5.7.1	Display Intensity	(2A3) R1
5.7.2	1000 Hz, 0 dBm CAL Reference	(1A1) R11, R5
5.7.3	Transmit Level	(1A1) R2, R7, R1, R114
5.7.4	Frequency Dial	(1A1) R13, R10, R14
5.7.5	Sine Distortion	(1A1) R116, R6, R8, R12, R9
5.7.6	Vertical Deflection	(2A1) R4, R89
5.7.7	Horizontal Deflection	(2A1) R2, R3
5.7.8	Sweep Range	(1A3) R2, R3, R1
5.7.9	Peak Detector Symmetry	(2A1) R1
5.7.10	Impedance Measurement	(1A1) R4
5.7.11	Return Loss	(1A1) R3

Each calibration adjustment is relatively unaffected by subsequent adjustments in the sequence. The adjustments, however, depend on previous settings in the sequence. Always at least verify the results of preceding adjustments before making a calibration out of sequence. Also verify any subsequent calibrations in the sequence after making an adjustment. If the test set is extremely out of calibration, center all adjustments and perform all calibration procedures in sequence.

TEST EQUIPMENT

Calibration test equipment is used as a reference for measuring the output of the power supplies and transmitter unit. Receiver performance is visually

monitored by observing the CRT display with the calibrated transmitter as a reference. The following test equipment, or equivalent of other manufacturers, is recommended:

(1) Oscilloscope: Tektronix 454

(2) Distortion Analyzer: Hewlett-Packard 334A

(3) Automatic Counter: Dana 8110

(4) Digital Differential Multimeter: Fluke 8000A

(5) DC Power Supply: Adjustable between +12 V and +20 V

(6) BNC-to-Banana Cable: Hewlett-Packard 11001A (3 each)

(7) BNC "T" Adapter: Hewlett-Packard 1250-0781

(8) 600 Ohm ±1% Resistor

POWER SUPPLY VERIFICATION AND CALIBRATION PROCEDURE

The test set has two independent power supplies: one is in the receiver power supply unit and the other is in the transmitter unit. Each power supply has its own ac line cord. Calibration adjustments are provided for the correct ZENER current.

The transmitter and receiver power supplies are to be removed from their cases for verification and adjustment.

TRANSMITTER ZENER CURRENT ADJ. (Normally Factory Adjusted)

(1) Disconnect transmitter from AC line.

(2) Unplug red wire from 1A4 (battery charger board) +BATT pin.

(3) Connect current meter (200 mA) between disconnected red wire and +Batt pin.

(4) Plug in transmitter AC line cord and turn power switch on.

(5) Verify or adjust (1A4) R-4 for 65 mA.

RECEIVER ZENER CURRENT ADJ. (Normally Factory Adjusted)

(1) Disconnect receiver from AC line.

(2) Unplug red wire from 3A1 (battery charger board) +BATT pin.

(3) Connect current meter (200 mA) between disconnected red wire and +BATT pin.

(4) Plug in receiver AC line cord and turn power switch on.

(5) Verify or adjust (3A1) R-4 for 170 mA.

PERFORMANCE VERIFICATION AND CALIBRATION PROCEDURE

After completing the power supply verification or calibration and reassembling the test set, set up the test equipment as shown in Figure 5-1.

Turn on both the transmitter and receiver (POWER switches ON) and allow 30 minutes warmup.

Begin each group of calibrations with the preliminary front panel settings listed below.

Transmitter Unit

SWEEP MODE Pushbuttons	MAN
SWEEP RANGE Pushbuttons	5 kHz
FREQUENCY Dial	1000 Hz
SWEEP SPEED Control	As Desired
CAL and MEASUREMENT Pushbuttons	TRAN LEVEL
TRANSMIT IMPEDANCE Pushbuttons	600Ω
TRANSMIT LEVEL Selectors	0 dBm
HOLDING COIL Switch	OUT

Receiver Unit

STATUS Pushbuttons	OPERATE
SWEEP RANGE Pushbuttons	5 kHz
CAL and MEASUREMENT Pushbuttons	REC LEVEL
RECEIVE IMPEDANCE Pushbuttons	600Ω
RECEIVE LEVEL Selectors	0 dBm
HOLDING COIL Switch	OUT

5.7.1 Display Intensity

(1) Set transmitter AUTO pushbutton.

(2) Adjust receiver TRACE INTENSITY control fully clockwise.

CAUTION

Avoid excessive brilliance that will damage the phosphor coating of the CRT face. If TRACE INTENSITY fully clockwise causes excessive brilliance, adjust (2A3) R1 fully counterclockwise and then TRACE INTENSITY control fully clockwise.

(3) Verify or adjust (2A3) R1 for maximum desirable brilliance of beam trace.

(4) Adjust receiver TRACE INTENSITY control for normal desirable brilliance of beam trace.

(5) Reset transmitter MAN pushbutton.

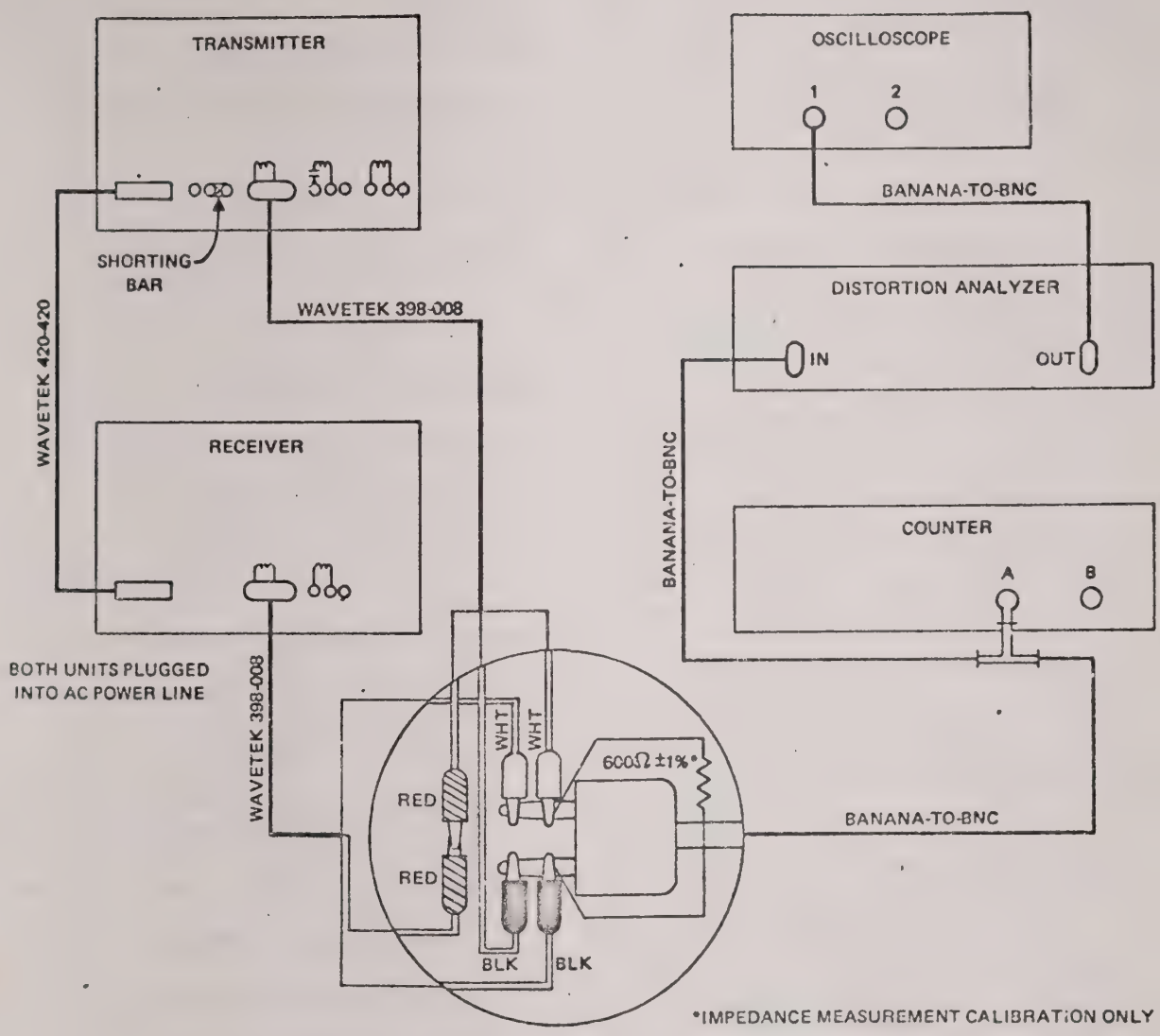


Figure 5-1. General Calibration Setup and Connections

5.7.2 1000 Hz, 0 dBm CAL Reference

(1) Set transmitter CAL pushbutton.

(2) Verify or adjust (1A1) R11 for 1000 Hz ±2 Hz at counter.

(3) Verify or adjust (1A1) R5 for 0.775 Vrms (0 dBm) at distortion analyzer.

(4) Reset transmitter TRAN LEVEL pushbutton.

5.7.3 Transmit Level

(1) Verify or adjust (1A1) R2 for 0.775 Vrms (0 dBm) at distortion analyzer.

(2) Set transmitter TRANSMIT LEVEL FINE selector to −10 dBm.

(3) Verify or adjust (1A1) R7 for 0.245 Vrms at distortion analyzer.

(4) Set transmitter TRANSMIT IMPEDANCE to 900Ω.

(5) Set receiver RECEIVE IMPEDANCE to 900Ω.

(6) Set transmitter TRANSMIT LEVEL selectors to 0 dBm.

(7) Verify or adjust (1A1) R1 for 0.950 Vrms at distortion analyzer.

5.7.4 Frequency Dial

(1) Set transmitter FREQUENCY dial to 5 kHz.

(2) Verify or adjust (1A1) R13 for 5 kHz ±10 Hz at counter.

(3) Set transmitter FREQUENCY dial to 50 Hz.

(4) Verify or adjust (1A1) R10 for 50 Hz ±2 Hz at counter.

(5) Set transmitter SWEEP RANGE to 15 kHz.

(6) Set transmitter FREQUENCY dial to 15 kHz.

(7) Verify or adjust (1A1) R14 for 15 kHz ±50 Hz.

(8) Remake preliminary front panel settings.

5.7.5 Sine Distortion

(1) Set transmitter FREQUENCY dial to 50 Hz.

(2) Set transmitter Z X 1 pushbutton.

(3) Set receiver Z pushbutton.

(4) Verify or adjust (1A1) R116 to remove "notch" in sine wave at oscilloscope.

(5) Set transmitter TRAN LEVEL pushbutton.

(6) Set receiver REC LEVEL pushbutton.

(7) Set transmitter SWEEP RANGE to 15 kHz.

(8) Set transmitter FREQUENCY dial to 15 kHz.

(9) Verify or adjust (1A1) R6, R8, and R12 for minimum distortion at distortion analyzer.

NOTE

Varying R8 causes shifts in frequency; therefore, vary R8 in small increments to allow analyzer to settle from momentary off-scale readings.

(10) Set transmitter FREQUENCY dial to 150 Hz.

(11) Verify or adjust (1A1) R9 for minimum distortion at distortion analyzer.

(12) Repeat Steps 8 thru 11 for most minimum distortion, less than 1.0%, at distortion analyzer (minimum typically less than 0.5%). Reverify procedure in Paragraph 5.7.2.

(13) Remake preliminary front panel settings.

5.7.6 Vertical Deflection

(1) Set transmitter AUTO pushbutton.

(2) Verify or loosen and rotate deflection yoke about CRT neck for vertical beam trace parallel to vertical scale lines; retighten to fix position.

(3) Set transmitter TRANSMIT LEVEL selectors to −20 dBm.

(4) Adjust receiver front panel ↕ control for beam trace coincident with −20 dB scale line.

(5) Set transmitter TRANSMIT LEVEL selectors to 0 dBm.

(6) Verify or adjust (2A1) R4 for beam trace coincident with 0 dB scale line.

(7) Repeat Steps 3 thru 6 for most accurate beam trace coincidence, the 0 dB trace to be within 0.1 dB of scale line.

(11) Remake preliminary front panel settings.

5.7.7 Horizontal Deflection

(1) Adjust receiver front panel ↔ control for beam spot to 1 kHz.

(2) Set transmitter FREQUENCY dial to 5 kHz.

(3) Verify or adjust (2A1) R2 for beam spot coincident with 5 kHz scale line.

(4) Repeat Steps 1 thru 3 for most accurate beam spot coincidence.

(5) Set transmitter SWEEP RANGE to 15 kHz.

(6) Set receiver SWEEP RANGE to 15 kHz.

(7) Set transmitter FREQUENCY dial to 15 kHz.

(8) Verify or adjust (2A1) R3 for beam spot coincident with 15 kHz scale line.

(9) Remake preliminary front panel settings.

5.7.8 Sweep Range

(1) Set transmitter AUTO pushbutton.

(2) Verify or adjust (1A3) R2 for left end of beam trace coincident with 50 Hz scale line.

(3) Verify or adjust (1A3) R3 for right end of beam trace coincident with 5 kHz scale line.

(4) Repeat Steps 2 and 3 for most accurate beam trace sweep width.

NOTE

Sharp dip at left end of beam trace may occur due to frequencies less than 50 Hz; proper adjustment requires this dip to be no greater than 0.5 dB from 0 dB scale line.

(5) Set transmitter SWEEP RANGE to 15 kHz.

(6) Set receiver SWEEP RANGE to 15 kHz.

(7) Verify or adjust (1A3) R1 for right end of beam trace coincident with 15 kHz scale line.

(8) Remake preliminary front panel settings.

5.7.9 Peak Detector Symmetry

(1) Set transmitter TRANSMIT LEVEL selectors to −31 dBm.

(2) Verify or adjust (2A1) R1 for continuous beam trace just before distortion of the trace.

(3) Remake preliminary front panel settings.

5.7.10 Impedance Measurement

(1) Connect 600Ω ±1% between transmitter output signal lines (see Figure 5-1).

(2) Set transmitter AUTO pushbutton.

(3) Set transmitter Z X 1 pushbutton.

(4) Set receiver Z pushbutton.

(5) Verify or adjust (1A1) R4 for beam trace coincident with 600Ω scale line. If R4 is adjusted, reverify calibration from Procedure 5.7.5 on.

(6) Disconnect 600Ω resistor and remake preliminary front panel settings.

5.7.11 Return Loss

(1) Unplug test cable (WAVETEK 398-008) from transmitter output.

(2) Set transmitter AUTO pushbutton.

(3) Set transmitter RETURN LOSS pushbutton.

(4) Set receiver RETURN LOSS pushbutton.

(5) Verify or adjust (1A1) R3 for beam trace coincident with 0 dB scale line.

(6) Plug test cable back in and remake preliminary front panel settings.

5.7.12 Signal Frequency Suppression

(1) Set transmitter RETURN LOSS pushbutton.

(2) Set receiver RETURN LOSS pushbutton.

(3) Set transmitter FREQUENCY dial for 2450 Hz at counter.

(4) Verify or adjust (1A6) R14 for frequency drop-off at counter.

(5) Set transmitter FREQUENCY dial for 2750 Hz at counter.

(6) Verify or adjust (1A6) R10 for frequency comeback at counter.

(7) Remake preliminary front panel settings.

REV. 5

Assembly drawings (with parts lists) and schematics are arranged as follows:

Chassis Interconnection	420-200
Chassis Sch	-223
Transmitter	
Transmitter Assy	-001
Main Board Assy	-014
" " Sch	-214
Battery Charger Board Assy	-010
" " " Sch	-210
Attenuator Assy	-011
" Sch	-211
Sweep Generator Assy	-013
" " Sch	-213
Receiver	
Receiver Assy	-002
Main Board Assy	-016
" " Sch	-216
High Voltage Supply Assy	-012
" " " Sch	-212
Attenuator Assy	-022
" Sch	-222
Power Supply (Receiver)	-003
Battery Charger Board Assy	-021
" " " Sch	-221

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REV	ECN	BY	DATE	APP
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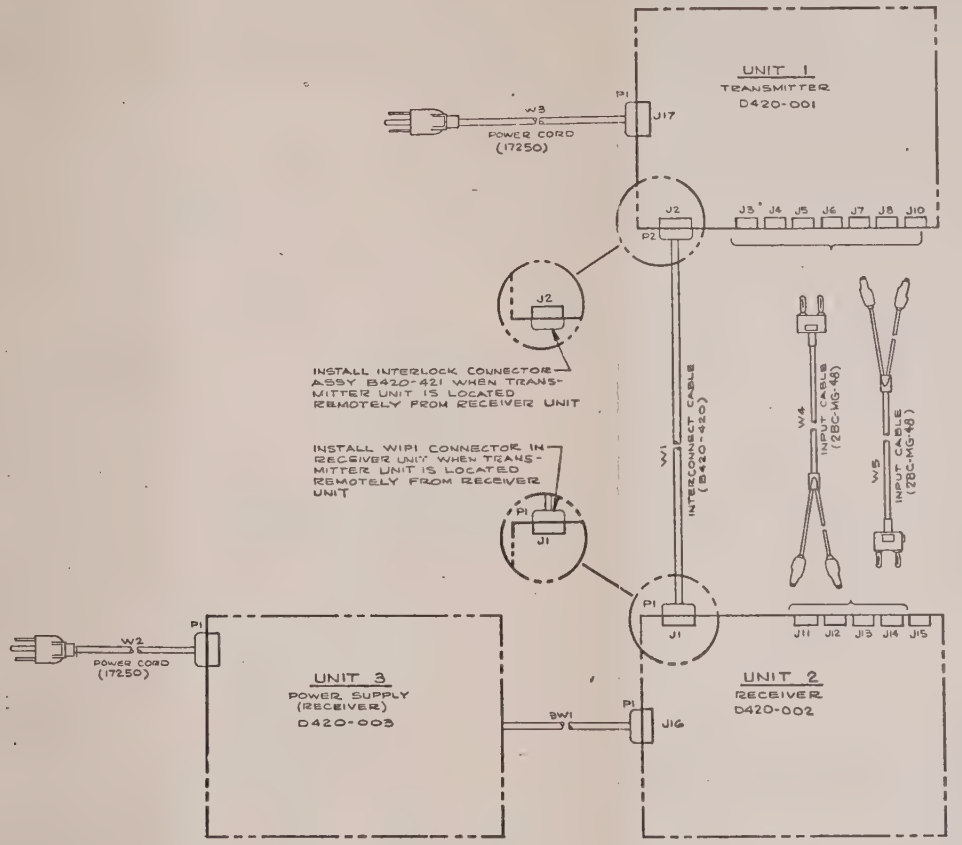
C	9-26-1053			
D	ECN 1249			



UNIT 1 SUBASSEMBLIES
1A1 - TRANSMITTER MAIN BD
1A2 - ATTENUATOR BD
1A3 - SWEEP GENERATOR
1A4 - BATTERY CHARGER BD
1A5 - BATTERY ASSY

UNIT 3 SUBASSEMBLIES
3A1 - BATTERY CHARGER BD
3A2 - BATTERY ASSY

UNIT 2 SUBASSEMBLIES
2A1 - RECEIVER MAIN BD
2A2 - ATTENUATOR BD
2A3 - HIGH VOLTAGE BD
2A4 - INTERFACE BD
2A5 - CATHODE RAY TUBE ASSY
2A6 - NOISE BOARD

NOTE UNLESS OTHERWISE SPECIFIED

WAVETEK SAN DIEGO, CALIFORNIA

TITLE
SCHEMATIC DIAGRAM, CHASSIS (INTERCONNECT)

MODEL NO. 420 | DWG NO. D420-200 | REV D

SHEET 1 OF 3

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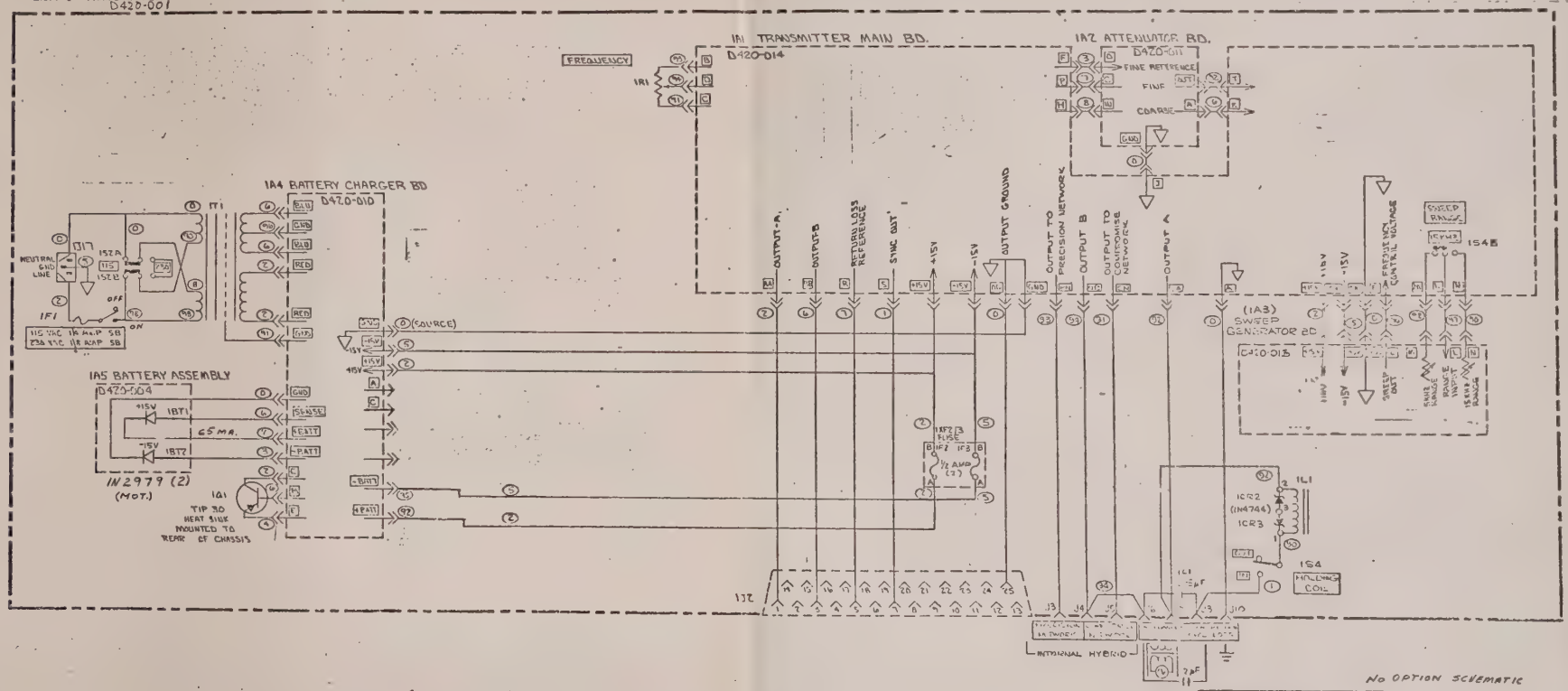


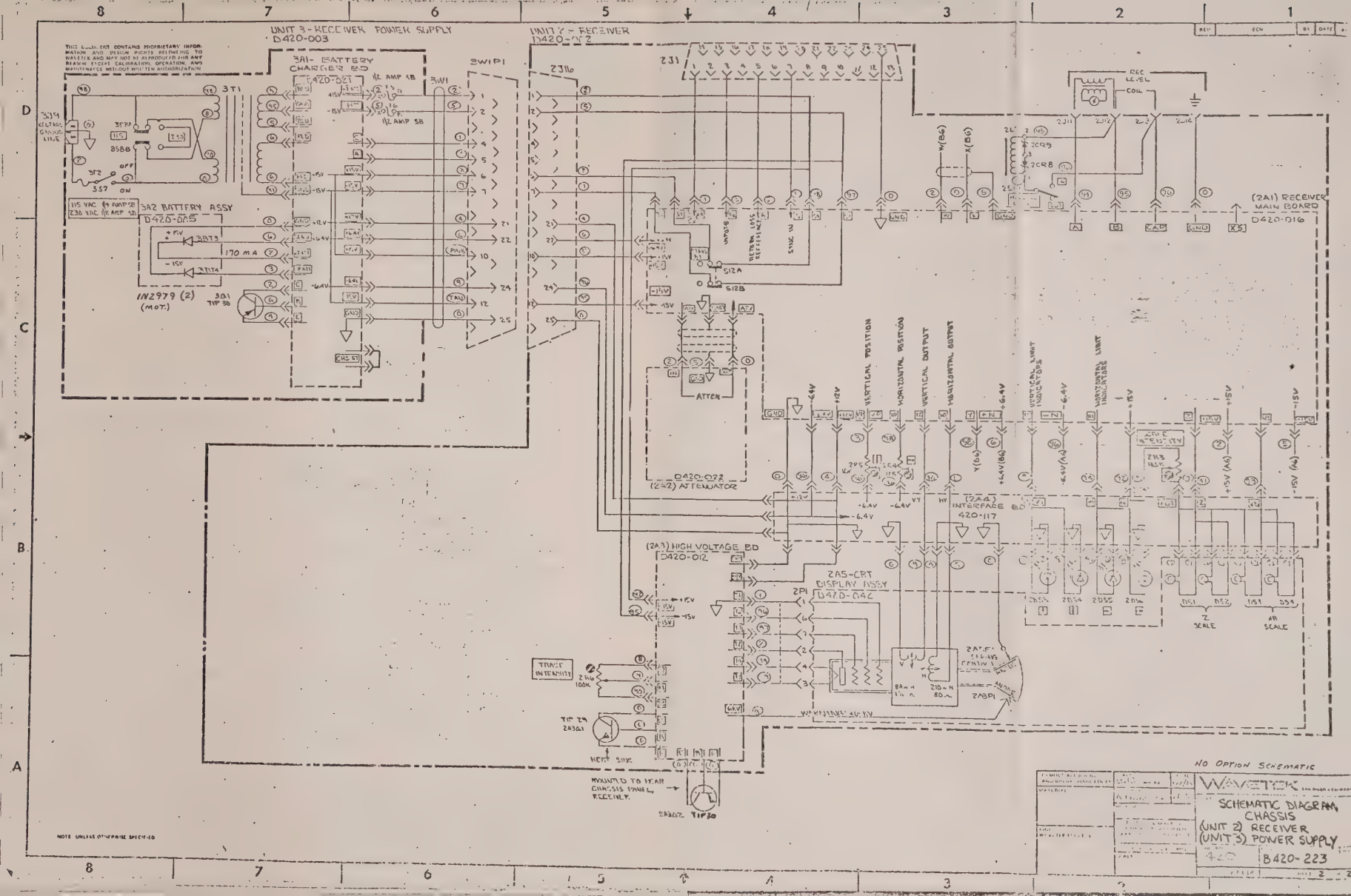
NOTE UNLESS OTHERWISE SPECIFIED

No OPTION SCHEMATIC

WAVETEK

SCHEMATIC DIAGRAM
CHASSIS
(UNIT) TRANSMITTER

420 B420-223


UNIT 3 - RECEIVER POWER SUPPLY D420-003
UNIT 2 - RECEIVER D420-002
3A1 - BATTERY CHARGER BD D420-021
3A2 BATTERY ASSY D420-005
115 VAC 1/4 AMP SB
230 VAC 1/8 AMP SB
1/2 AMP SB
1/2 AMP SB
3T1
8588
3F1
3F2
3S7
3S9
OFF
ON
VOLTAGE SELECTOR LINE
3W1
3W1P1
2J1
2J1P6
2J1P1
2J1P2
2J1P3
2J1P4
2J1P5
2J1P7
2J1P8
2J1P9
2J1P10
2J1P11
2J1P12
2J1P13
2J1P14
2J1P15
REC LEVEL COIL
2L1
2CR9
2CR8
W(B6)
X(B6)
(2A1) RECEIVER MAIN BOARD D420-016
A
B
CAL
GND
X5
5I2A
5I2B
UNBLANK
RETRACE BLANK
SYNC IN
ATTEN
D420-022 (2A2) ATTENUATOR
VERTICAL POSITION
HORIZONTAL POSITION
VERTICAL OUTPUT
HORIZONTAL OUTPUT
VERTICAL LIMIT INDICATORS
HORIZONTAL LIMIT INDICATORS
(2A4) INTERFACE BD 420-117
(2A3) HIGH VOLTAGE BD D420-012
2A5-CRT DISPLAY ASSY D420-042
2P1
2A5P1
2A5J1
2A5J2
2A5J3
2A5J4
Z SCALE
AR SCALE
TRACE INTENSITY
2R46 100K
TIP 29 2A3Q1
HEAT SINK
MOUNTED TO REAR CHASSIS PANEL, RECEIVE.
2A3Q2 TIP30
170 MA
1N2979 (2) (MOT.)
3Q1 TIP 30
NO OPTION SCHEMATIC
WAVETEK
SCHEMATIC DIAGRAM CHASSIS (UNIT 2) RECEIVER (UNIT 3) POWER SUPPLY
B420-223

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REV	ECN		
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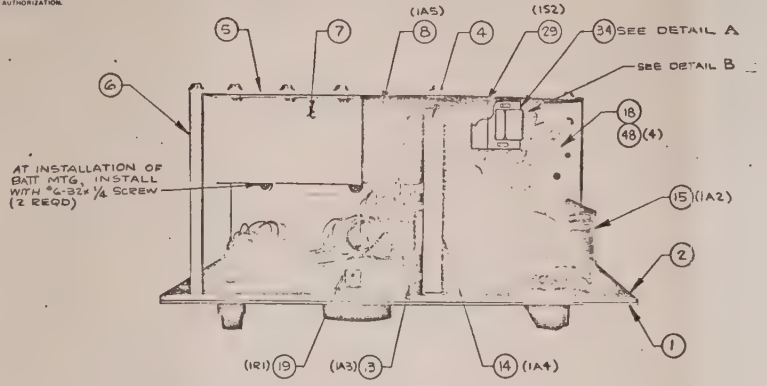
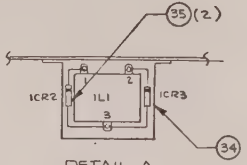
C	E 885, 1053		
D	E N 96		
E	ECN 1693		

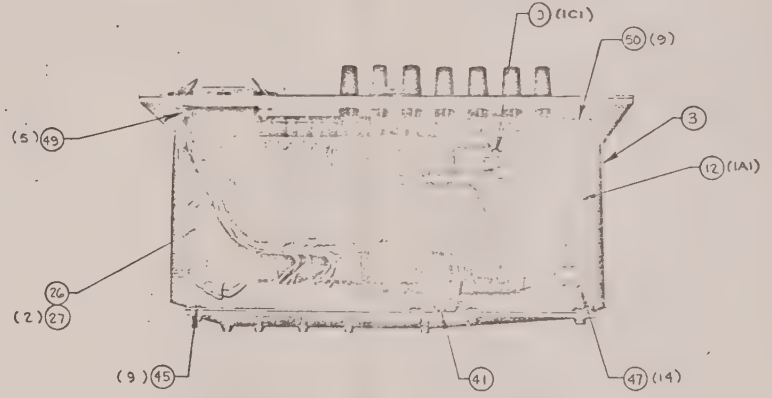


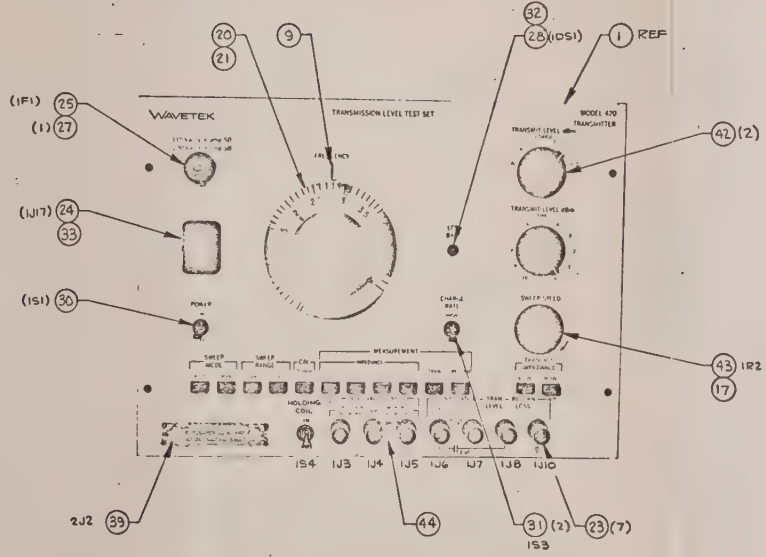


DETAIL A
SCALE 1 1/1

INSTALL TRANSISTOR USING HEAT SINK COMPOUND, MICA INSULATOR & NYLON SHOULDER WASHER

DETAIL B





NOTE: UNLESS OTHERWISE SPECIFIED

WAVETEK		
ASSEMBLY, TRANSMITTER		
420	D420-001	E

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REV	ECN	BY	DATE	APP

PARTS LIST

LINE NO	DESCRIPTION	MFGR	FSCM	MFGR P/N	QTY
1	FRONT PANEL	WAVETEK	23338	C420-300	1
2	SUB PANEL	WAVETEK	23338	C420-301	1
3	CHASSIS ASSY, HORIZ	WAVETEK	23338	C420-319	1
4	CHASSIS, VERT	WAVETEK	23338	C420-320	1
5	REAR PANEL	WAVETEK	23338	C420-318	1
6	BAR, SUPPORT	WAVETEK	23338	A420-323	1
7	BRACKET, BATTERY	WAVETEK	23338	C420-322	1
8	BATTERY ASSY	WAVETEK	23338	C420-004	1
9	INDICATOR, DIAL	WAVETEK	23338	B110-338	1
10	CAPACITOR	AMERICAN RADIONICS	07994	A420-505-81	1
11					
12	MAIN BOARD	WAVETEK	23338	D420-014	1
13	SWEEP GENERATOR BD	WAVETEK	23338	D420-013	1
14	BATTERY CHARGER BD	WAVETEK	23338	D420-010	1
15	ATTENUATOR ASSY	WAVETEK	23338	D420-011	1
16					
17	POTENTIOMETER	WAVETEK	23338	A420-410	1
18	TRANSFORMER	WAVETEK	23338	110-500	1
19	POTENTIOMETER	WAVETEK	23338	131-R1	1
20	DIAL BLANK	WAVETEK	23338	130-333	1
21	DIAL KNOB	WAVETEK	23338	130-325	1
22					
23	BINDING POST	SUPERIOR	58474	DF21BC	7
24	A.C. POWER RECEPTACLE	SWITCHCRAFT	82389	EAC-301	1
25	FUSE HOLDER	LITTLEFUSE	75915	345001	1
26	FUSE BLOCK	LITTLEFUSE	75915	357002	1
27	FUSE 1/4 AMP S.B.	LITTLEFUSE	75915	313.250	1
28	LED	OPCOA		LSM-5L-1	1

PARTS LIST

LINE NO	DESCRIPTION	MFGR	FSCM	MFGR P/N	QTY
29	SWITCH 115/230	SWITCHCRAFT	82389	46256LF	1
30	SWITCH DPDT	C & K	09353	7201-PDCN	1
31	SWITCH SPDT	C & K	09353	7101-PDCN	2
32	LED MTG KIT	OPCOA		OC1	1
33	SOLDER LUG	H.M. SMITH	83330	1414-4	1
34	MOLDING COIL	WAVETEK	23338	B420-525	1
35	DIODE, ZENER	I.R.	81483	1N4744	2
36	GUARD SOLDER	SWITCHCRAFT	82389	46256-LPSG	1
37	TRANSISTOR TIP-30	TI	01295	TIP 30	1
38	FUSE 1/2 AMP S.B.	LITTLEFUSE	75915	313.500	2
39	SPRING LATCH ASSY	CANNON	31746	D110277	1
40					
41	GROMMET	H.M. SMITH	83330	2175	4
42	KNOB, SKIRTED BAR	RAYTHEON	94144	708-3-2G	2
43	KNOB, SKIRTED	RAYTHEON	94144	70-38L-2G	1
44	SHORTING BAR	SUPERIOR	58474	938-L	1
45	SPEED NUT	TINNERMAN	78553	C880-632	9
46	STANDOFF	USECO		1938A 1/4-11	8
47	SCREW, SELF LOCKING 6-32 X 5/16	LONG-LOK	16941	LP-35206-227	14
48	SCREW, 86-32 X 1 1/2 LONG	COML			4
49	NUT, SELF LOCKING 84-40	SPS	56878	21FA-448	5
50	NUT, SELF LOCKING 86-32	SPS	56878	21FA-632	9

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	MFG R. GUAMA	DATE	WAVETEK SAN DIEGO, CALIFORNIA
MATERIAL	ENGINEER A.G. JUSTICE		TITLE ASSEMBLY, TRANSMITTER
FINISH WAVETEK PROCESS	RELEASE APPROV		
	TOLERANCES UNLESS OTHERWISE SPECIFIED XXX ± .010 XX ± .03 ANGLES ± 1°		
	APPROVED		
	DRAWN		MODEL NO 420
	DATE		DWG NO B420-0001 REV E
			CAGE 23338 SHEET 1 OF 2

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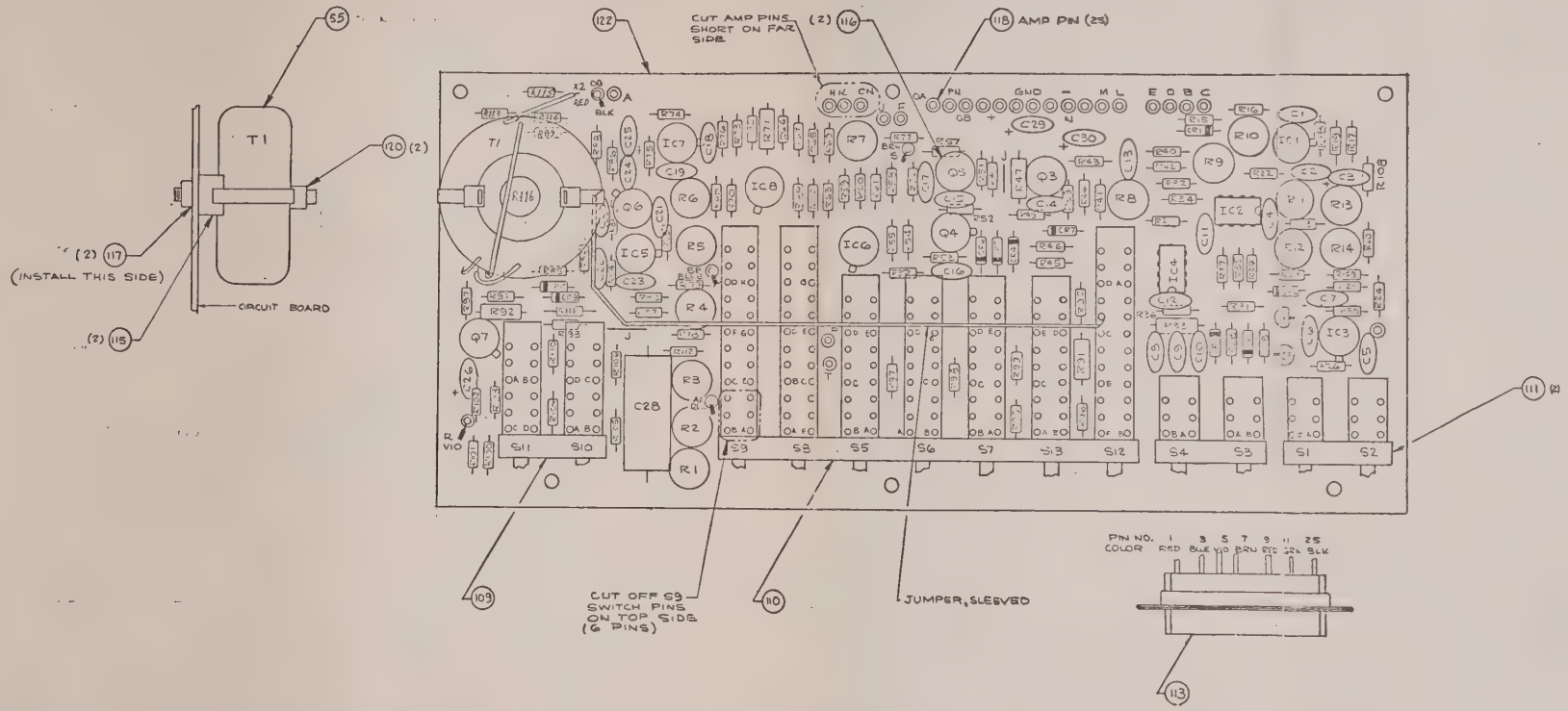
REV	ECN	BY	DATE	APP
D	#709, #712	ED	7/83	
E	#722, 738, 771	EH	3/84	
F	ECN 940			
G	#994	EC	11/16	
H	E-U 1211A		4-3	
J	ECN 1302	RB	6/85	



1. 10 K MATCHED RESISTORS (ITEM 103) ARE TO BE INSTALLED IN SETS AS FOLLOWS: R24 & R30 ; R61 & R63 ; R67 & R70.
NOTE UNLESS OTHERWISE SPECIFIED

MATERIAL		WAVETEK SAN DIEGO, CALIFORNIA
		TITLE: ASSEMBLY MAIN BOARD (TRANSMITTER)
		420 / D420-014 / J
		23318

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REV	ECN	BY	DATE	APP

PARTS LIST

LINE NO	DESCRIPTION	MFGR	FSCM	MFGR P/N	QTY
1	CAPACITORS				
2	CERAMIC DISC 1000V 10pF	CRL	71590	DD100	1
3	CERAMIC DISC 1000V 33pF	CRL	71590	DD330	2
4	CERAMIC DISC 1000V 47pF	CRL	71590	DD470	5
5					
6					
7	CERAMIC DISC 1000V 330pF	CRL	71590	DD331	1
8	CERAMIC DISC 1000V 220pF	CRL	71590	DD221	2
9	SILVER MICA 1% 500V 910pF	ARCO	02799	DM15-911F	3
10					
11	CERAMIC DISC 1000V 10% .001μF	CRL	71590	DD102	4
12	CERAMIC DISC 50V 10% .005μF	CRL	71590	CK502	2
13	CERAMIC DISC 1000V 10% .01μF	CRL	71590	CK103	2
14	MYLAR ±1% 2.35μF	AMERICAN RADIONICS	07994	MVTK 2MFW-205K (-82)	1
15					
16	TANTALUM 35V 33μF	SPRAGUE	56289	196D336X9035TE4	6
17					
18					
19					
20					
21					
22	DIODES				
23	DIODES 6.4V ZENER	DICKSON	12954	IN4581	1
24	DIODES FD6666	FAIRCHILD	33888	FD6666	7
25	DIODES (MATCHED SET)	DICKSON	12954	IN4581 (-83)	2
26					
27					
28	INTEGRATED CIRCUITS				

PARTS LIST

LINE NO	DESCRIPTION	MFGR	FSCM	MFGR P/N	QTY
29	INTEGRATED CIRCUITS μA709C	FAIRCHILD	33888	μA709C (-13)	4
30	INTEGRATED CIRCUITS LM301AN	NATIONAL	27014	LM301AN	2
31	INTEGRATED CIRCUITS CA3019	RCA	86684	CA3019	2
32					
33					
34					
35	POTENTIOMETERS				
36	POTENTIOMETERS 100Ω	BECKMAN	80740	91AR100Ω	1
37	POTENTIOMETERS 1K	BECKMAN	80740	91AR1K	3
38	POTENTIOMETERS 5K	BECKMAN	80740	91AR5K	5
39	POTENTIOMETERS 10K	BECKMAN	80740	91AR10K	1
40	POTENTIOMETERS 100K	BECKMAN	80740	91AR100K	4
41	POTENTIOMETERS 500Ω	BECKMAN	80740	91AR500Ω	1
42					
43					
44	TRANSISTORS				
45	TRANSISTORS 2N2219A	MOTOROLA	04713	2N2219A	1
46	TRANSISTORS 2N2905A	FAIRCHILD	33888	2N2905A	1
47	TRANSISTORS 2N3638	FAIRCHILD	33888	2N3638	2
48	TRANSISTORS 2N5458	MOTOROLA	04713	2N5458	1
49	TRANSISTORS 2N5461	MOTOROLA	04713	2N5461	1
50	TRANSISTORS	TECH PROD		TP605	1
51					
52					
53					
54	TRANSFORMER				
55	TRANSFORMER 61288	WAVETEK	23138	8420-505	1
56					
57					
58					

PARTS LIST

LINE NO	DESCRIPTION	MFGR	FSCM	MFGR P/N	QTY
59	RESISTORS				
60	METAL FILM 1/8W 1% 10Ω	CORNING	16299	RN55D	8
61	METAL FILM 1/4W 1% 49.9Ω	CORNING	16299	RN60D	3
62	METAL FILM 1/8W 1% 100Ω	CORNING	16299	RN55D	3
63	METAL FILM 1/8W 1% 121Ω	CORNING	16299	RN55D	1
64	METAL FILM 1/8W 1% 124Ω	CORNING	16299	RN55D	1
65	METAL FILM 1/8W 1% 200Ω	CORNING	16299	RN55D	1
66	METAL FILM 1/8W 1% 301Ω	CORNING	16299	RN55D (-79)	2
67	METAL FILM 1/8W 1% 316Ω	CORNING	16299	RN55D	3
68	METAL FILM 1/8W 1% 499Ω	CORNING	16299	RN55D	2
69	METAL FILM 1/8W 1% 604Ω	CORNING	16299	RN55D (-80)	2
70	METAL FILM 1/8W 1% 750Ω	CORNING	16299	RN55D	1
71	METAL FILM 1/8W 1% 301Ω	CORNING	16299	RN55D (-85)	1
72	METAL FILM 1/8W 1% 604Ω	CORNING	16299	RN55D (-86)	1
73	METAL FILM 1/8W 1% 1.00K	CORNING	16299	RN55D	4
74	METAL FILM 1/8W 1% 1.21K	CORNING	16299	RN55D	1
75	METAL FILM 1/8W 1% 1.50K	CORNING	16299	RN55D	5
76	METAL FILM 1/8W 1% 1.96K	CORNING	16299	RN55D	1
77	METAL FILM 1/8W 1% 2.00K	CORNING	16299	RN55D	2
78	METAL FILM 1/8W 1% 2.49K	CORNING	16299	RN55D	2
79	METAL FILM 1/8W 1% 3.32K	CORNING	16299	RN55D	5
80					
81	METAL FILM 1/8W 1% 4.02K	CORNING	16299	RN55D	1
82	METAL FILM 1/8W 1% 4.32K	CORNING	16299	RN55D	4
83	METAL FILM 1/8W 1% 4.99K	CORNING	16299	RN55D	2
84	METAL FILM 1/8W 1% 6.98K	CORNING	16299	RN55D	1
85	METAL FILM 1/8W 1% 8.87K	CORNING	16299	RN55D	2
86	METAL FILM 1/8W 1% 9.53K	CORNING	16299	RN55D	1
87	METAL FILM 1/8W 1% 10.0K	CORNING	16299	RN55D	1

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN GSCHICHT 4-4-73	WAVETEK SAN DIEGO, CALIFORNIA	
MATERIAL —	ENGINEER A.G. JUSTICE 6-25-73	TITLE ASSEMBLY, MAIN BOARD (TRANSMITTER)	
FINISH WAVETEK PROCESS —	RELEASE APPD		
	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 ANGLES ± 1°		
	DRAWING SIZE D	MODEL NO 420	DWG NO 0420-014 REV J
	SCALE —	CAGE 23138	SHEET 2 OF 4

MAINTENANCE BEYOND THIS LEVEL REQUIRES WRITTEN AUTHORIZATION

PARTS LIST

ITEM NO.	DESCRIPTION	MFGR	ITEM	MFGR P N	QTY
[illegible]	METAL FILM 1/8W 1% 12.1K	CORNING	16299	RN55D	1
[illegible]	METAL FILM 1/8W 1% 13.0K	CORNING	16299	RN55D	1
[illegible]	METAL FILM 1/8W 1% 21.5K	CORNING	16299	RN55D	1
[illegible]	METAL FILM 1/8W 1% 24.9K	CORNING	16299	RN55D	1
[illegible]	METAL FILM 1/8W 1% 30.1K	CORNING	16299	RN55D	2
[illegible]	METAL FILM 1/8W 1% 46.4K	CORNING	16299	RN55D	6
[illegible]	METAL FILM 1/8W 1% 49.9K	CORNING	16299	RN55D	2
[illegible]	METAL FILM 1/8W 1% 90.9K	CORNING	16299	RN55D	1
[illegible]	METAL FILM 1/8W 1% 124K	CORNING	16299	RN55D	1
[illegible]	METAL FILM 1/8W 1% 221K	CORNING	16299	RN55D	1
[illegible]	METAL FILM 1/8W 1% 237K	CORNING	16299	RN55D	1
[illegible]	METAL FILM 1/4W 1% 1M	CORNING	16299	RN60D	1
[illegible]	CARBON 1/2W 5% 10M	STACKPOLE	29604	RC20GF	1
[illegible]	METAL FILM 1/8W 1% 1.78K	CORNING	16299	RN55D	1
[illegible]	METAL FILM 1/8W 1% 27.4K	CORNING	16299	RN55D	1
[illegible]	RESISTOR MATCHED SETS 10.0K	CORNING	16299	RN55D (-54)	6
[illegible]	RESISTOR MATCHED SETS 15.8K	CORNING	16299	RN55D (-76)	2
[illegible]	RESISTOR MATCHED SETS 46.4K	CORNING	16299	RN55D (-77)	2
[illegible]	RESISTOR MATCHED SETS 110K	CORNING	16299	RN55D (-78)	2
[illegible]	METAL FILM 1/8W 1% 100K	CORNING	16299	RN55D	2
[illegible]	SWITCHES				
[illegible]	SWITCHES	WAVETEK	23338	B420-400	1
[illegible]	SWITCHES	WAVETEK	23338	B420-403	1
[illegible]	SWITCHES	WAVETEK	23338	B750-400	2
[illegible]					
[illegible]	CONNECTOR 25 PIN	CANNON	71468	DBC25S	1
[illegible]					
[illegible]	MTG BLOCK	PANDUIT	06383	TM-256C	2
[illegible]	TRANSISTOR PAD	MILTON ROSS	07047	10123M	1

PARTS LIST

ITEM NO.	DESCRIPTION	MFGR	ITEM	MFGR P N	QTY
[illegible]	SWAGE STANDOFF	AMP INC	[illegible]40	5-5418-8-0440-1A	2
[illegible]	AMP PINS (MALE)	AMP	00779	61182-2	30
[illegible]	AMP PINS (FEMALE)	AMP	00779	60598-8	5
[illegible]	TIE STRAP	PANDUIT	06383	SST-1.5M	2
[illegible]					
[illegible]	CIRCUIT BOARD	WAVETEK	23338	420-114E	1

NOTE UNLESS OTHERWISE SPECIFIED

WAVETEK ...

ASSEMBLY, MAIN BOARD

B420-014 J

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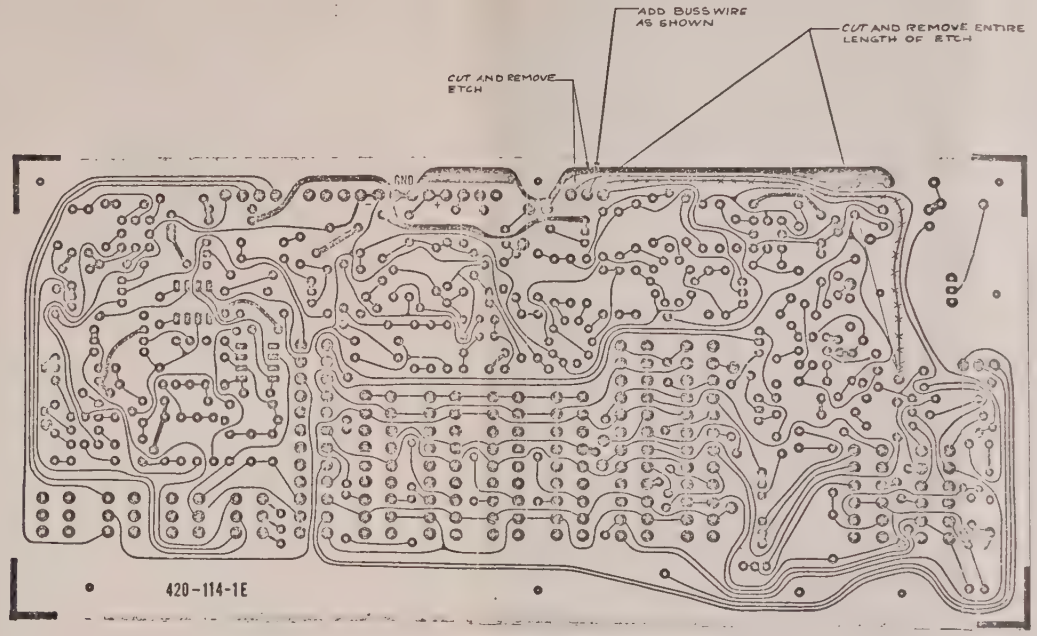
REV	ECN	BY	DATE	APP



NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES

MATERIAL

WAVETEK PROCESS

DRAWN

DATE

TOLERANCES UNLESS OTHERWISE SPECIFIED

DECIMALS .X ±.1 .XX ±.01 ANGLES ±1°

SCALE

WAVETEK SAN DIEGO, CALIFORNIA

TITLE ASSEMBLY MAIN BOARD (ARTWORK MODIFICATION) (TRANSMITTER)

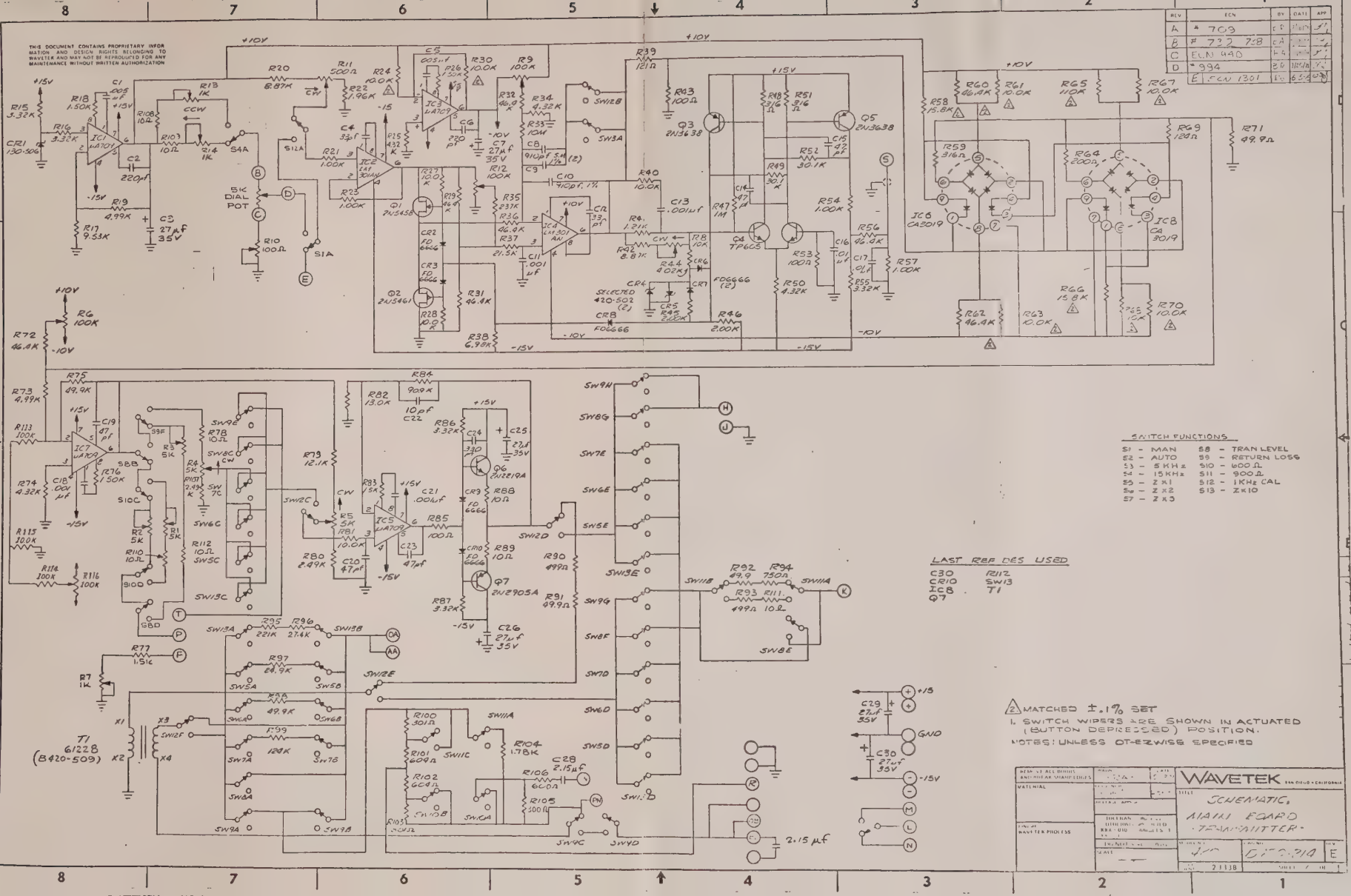
SERIES NO. 420

DRAWING NO. D420-014

REV. J

CAGE NO. 23338

SHEET 4 OF 4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REV ECN BY DATE APP
A # 709 CR 7/6/71 JT
B # 722 7-8 CA 7/6/71 JT
C ECN 940 HA 7/6/71 JT
D #994 RG 12/6/71 JT
E ECN 1301 RG 6-5-74 JT
+10V
-10V
+15V
-15V
R20 6.87K
R11 500Ω
R24 10.0K
R30 10.0K
R9 100K
R39 121Ω
R43 100Ω
R48 31.6Ω
R51 31.6Ω
R60 46.4K
R61 10.0K
R65 110K
R67 10.0K
R58 15.8K
R59 316Ω
R64 200Ω
R69 120Ω
R71 49.9Ω
R15 3.32K
R16 3.32K
R18 1.50K
R13 1K
R108 10Ω
R103 10Ω
R19 4.99K
R17 9.53K
R10 100Ω
C1 .005 µf
C2 220pf
C3 27µf 35V
C4 33pf
C5 .005µf
C6 220 pf
C7 27µf 35V
C8 910pf 5% (2)
C9
C10 470pf 1%
C11 .001 µf
C12 33 pf
C13 .001µf
C14 47 pf
C15 47 pf
C16 .01 µf
C17 .1µf
R21 1.00K
R23 1.00K
R27 10.0K
R29 464K
R35 237K
R36 46.4K
R37 21.5K
R12 100K
R40 10.0K
R41 1.21K
R42 8.87K
R44 402K
R45 2.00K
R46 2.00K
R47 1M
R49 30.1K
R52 30.1K
R53 100Ω
R54 1.00K
R56 46.4K
R57 1.00K
R55 3.32K
R62 46.4K
R63 10.0K
R66 15.8K
R70 10.0K
Q1 2N5458
Q2 2N5461
Q3 2N3638
Q4 TP6603
Q5 2N3638
IC1 UA709
IC2 LM 301AN
IC3 LM 301 AH
IC6 CA3019
IC8 CA 3019
CR1 130-506
CR2 FD 6666
CR3 FD 6666
CR4 SELECTED 420-502 (2)
CR5 FD6666
CR6 FD6666 (2)
CR7
CR8 FD6666
S1A
S1B
S2A
S2B
S3A
S3B
S4A
S4B
51K DIAL POT
CW
CCW
R6 100K
R72 46.4K
R75 49.9K
R73 4.99K
R113 100K
R74 4.32K
R115 100K
R116 100K
R117 100K
C18 .001 µf
C19 47 pf
R76 1.50K
R78 10Ω
R4 5K
R76 PIOT 2.49K
R3 5K
R2 5K
R1 5K
R110 10Ω
R112 10Ω
R111 10Ω
R77 1.51K
R7 1K
R79 12.1K
R82 13.0K
R84 909K
10pf C22
R86 3.32K
C24 330
C25 27µf 35V
Q6 2N2219A
CR9 FD 6666
R88 10Ω
R89 10Ω
CR10 FD 6666
Q7 2N2905A
R87 3.32K
C26 27µf 35V
R83 1.5K
C21 .001uf
R5 5K
RB1 10.0K
R85 100Ω
C20 47pf
C23 47pf
R80 2.49K
R90 499Ω
R91 49.9Ω
R92 49.9
R94 750Ω
R93 499Ω
R111 10Ω
C29 27µf 35V
C30 27µf 35V
GND
SW1A
SW1B
SW1C
SW1D
SW1E
SW2A
SW2B
SW2C
SW2D
SW2E
SW3A
SW3B
SW3C
SW4A
SW4B
SW4C
SW4D
SW5A
SW5B
SW6A
SW6B
SW7A
SW7B
SW8A
SW8B
SW9A
SW9B
SW9C
SW9D
SW9E
SW9F
SW9G
SW9H
SW10A
SW10B
SW11A
SW11B
SW11C
SW12A
SW12B
SW12C
SW13A
SW13B
SW13C
SW13D
SW13E
SW13F
SW13G
SW13H
T1 6/228 (8420-509)
X1
X2
X3
X4
R95 221K
R96 27.4K
R97 24.9K
R98 49.9K
R99 124K
R100 301Ω
R101 609Ω
R102 604Ω
R104 1.78K
R106 604Ω
R105 300Ω
C28 2.15µf
2.15 µf
SWITCH FUNCTIONS
S1 - MAN
S2 - AUTO
S3 - 5KHz
S4 - 15KHz
S5 - ZX1
S6 - ZX2
S7 - ZX3
S8 - TRAN LEVEL
S9 - RETURN LOSS
S10 - 600Ω
S11 - 900Ω
S12 - 1KHz CAL
S13 - ZX10
LAST REF DES USED
C30 R112
CR10 SW13
IC8 T1
Q7
2 MATCHED ±.1% SET
1. SWITCH WIPERS ARE SHOWN IN ACTUATED (BUTTON DEPRESSED) POSITION.
NOTES: UNLESS OTHERWISE SPECIFIED
WAVETEK SAN DIEGO, CALIFORNIA
SCHEMATIC, AM/FM BOARD TRANSMITTER
DWG. NO. 01-0214 REV. E
SCALE
SHEET 1 OF 1

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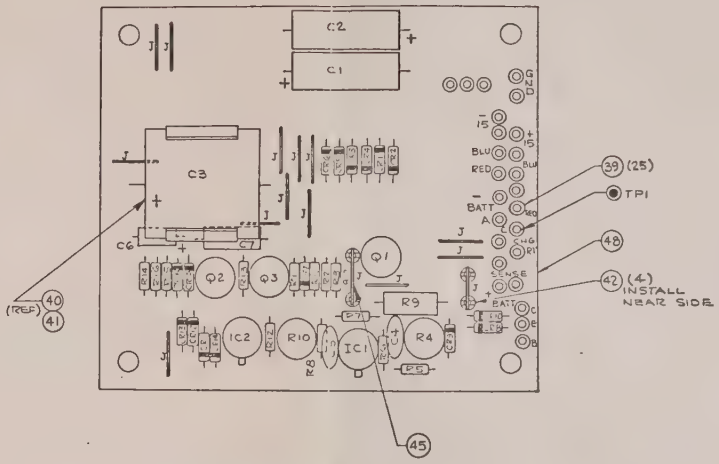
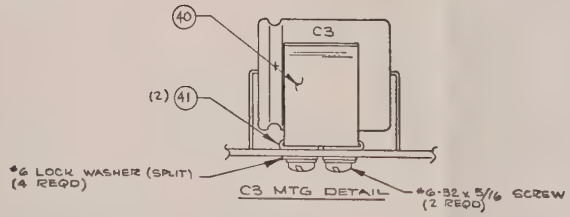
REV	ECN	BY	DATE	APP
C	773	BA		
D	ECN 911	DN		
E	ECN 934	BA		
F	ECN 959	RA		
G	ECN 1294	VL		
H	ECN 1302	VL		
J	ECN 1388	BR		





NOTE UNLESS OTHERWISE SPECIFIED

WAVETEK SAN DIEGO, CALIFORNIA

TITLE: ASSEMBLY BATTERY CHARGER BD (1A4) TRANSMITTER

SIZE 420 | DRAWING NO D420-010 | REV J

SCALE 2:1

23338

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REV	ECN	BY	DATE	APP

PARTS LIST

LINE NO	DESCRIPTION	MFGR	FSCM	MFGR P/N	QTY
1	CAPACITORS				
2	CERAMIC DISC 50V .005uF	CRL	71590	CK502	1
3	CERAMIC DISC 220PF	CRL	71590	DD221	1
4	TANTALUM .47uF	SPRAGUE	56289	150D474X9050B2	1
5	TANTALUM 10uF	SPRAGUE	56289	150D106X902B2	1
6	ELECTROLYTIC 50V 50uF	SPRAGUE	56289	500D506G050D7	2
7	ELECTROLYTIC 75V 250uF	SPRAGUE	56289	39D257G075JE4	1
8					
9					
10	DIODE 6.4V ZENER	DICKSON	12954	IN4581	1
11	DIODE 100V G.P. SILICON	MOTOROLA	04713	IN4002	7
12	DIODE 100V G.P. SILICON	FAIRCHILD	33888	FD6666	8
13					
14					
15					
16	INTEGRATED CIRCUITS uA709	FAIRCHILD	33888	uA709 C (-13)	1
17	INTEGRATED CIRCUITS uA709	FAIRCHILD	33888	uA709C (-44)	1
18					
19					
20	TRANSISTOR 2N3642	FAIRCHILD	33888	2N3642	1
21	TRANSISTOR 2N3643	FAIRCHILD	33888	2N3643	2
22					
23	RESISTOR CARBON 1W 5% 470Ω	STACKPOLE	29604	RC32GF471J	1
24	METAL FILM 1/8W 1% 1K	CORNING	16299	RN55D	4
25	METAL FILM 1/8W, 1% 1.5K	CORNING	16299	RN55D	1
26	METAL FILM 1/8W 1% 10K	CORNING	16299	RN55D	2
27	METAL FILM 1/8W 1% 21.5K	CORNING	16299	RN55D	1
28	METAL FILM 1/8W 1% 49.9K	CORNING	16299	RN55D	1
29	METAL FILM 1/8W 1% 69.8K	CORNING	16299	RN55D	1
30	METAL FILM 1/8W 1% 100K	CORNING	16299	RN55D	1

PARTS LIST

LINE NO	DESCRIPTION	MFGR	FSCM	MFGR P/N	QTY
31	METAL FILM 1/8W 1% 301K	CORNING	16299	RN55D	1
32	POTENTIOMETER 100Ω	BECKMAN	80740	91AR100Ω	1
33	POTENTIOMETER 10K	BECKMAN	80740	91AR10K	1
34	METAL FILM 1/8W 1% 56.2K	CORNING	16299	RN55D	1
35					
36					
37					
38					
39	AMP PINS	AMP	00779	61182-2	25
40	CLAMP	SEASTROM	85928	4511-100-68-2C	1
41	TINNERMAN CLIPS	TINNERMAN	78553	C880-632	2
42	TERMINALS	USECO	88245	2000B-1	4
43					
44	TRANSISTOR PAD	MILTON ROSS	07047	10123M	3
45	RESISTANCE WIRE 3/4"	WILBER DRIVER	72005	630 AWG (30PER FOOT)	-1
46					
47					
48	CIRCUIT BOARD	WAVETEK	23338	420-1108	1
49					
50					
51					
52					
53					
54					
55					
56					
57					
58					
59					

LINE ITEM REFERENCE LIST

REF DES	P/L LINE	REF DES	P/L LINE	REF DES	P/L LINE
C1	8	R1	27		
C2	6	R2	26		
C3	7	R3	28		
C4	2	R4	32		
C5	3	R5	24		
C6	4	R6	25		
C7	5	R7	24		
		R8	24		
		R9	23		
CR1	11	R10	33		
CR2	11	R11	29		
CR3	11	R12	34		
CR4	11	R13	30		
CR5	11	R14	34		
CR6	11	R15	26		
CR7	10	R16	31		
CR8	12	R17	45		
CR9	12				
CR10	11				
CR11	12				
CR12	12				
CR13	12				
CR14	12				
CR15	12				
CR16	12				
IC1	17				
IC2	18				
Q1	20				
Q2	21				
Q3	21				

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN M. BOCH 6-7	WAVETEK SAN DIEGO, CALIFORNIA	
MATERIAL	PROTECTION	TITLE ASSEMBLY BATTERY CHARGER BD (TRANSMITTER)	
	RELEASE APPR.		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 ANGLES ± 1° XX ± .03		
	DO NOT SCALE DRWG	MODEL NO. 420	DWG NO. B420-0101 REV J
	SCALE	CAGE NO. 23338	SHEET 1 OF 2

B420-0101 J

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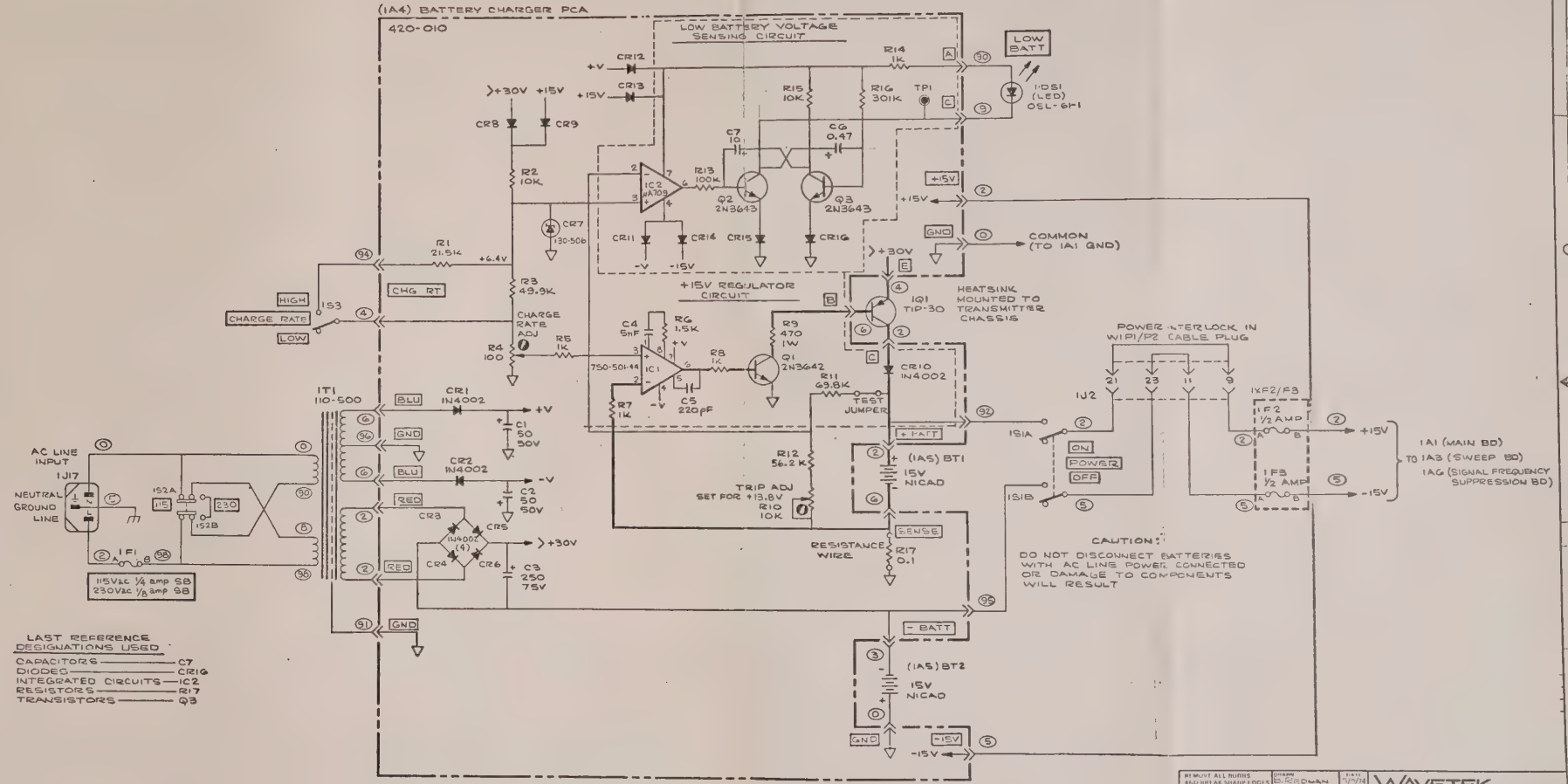
REV	ECN	BY	DATE	APP
A	ECN 1388	RB	1/31/78	
B	ECN 1388	RB	1/31/78	



LAST REFERENCE DESIGNATIONS USED

CAPACITORS	C7
DIODES	CR16
INTEGRATED CIRCUITS	IC2
RESISTORS	R17
TRANSISTORS	Q3

4. FOR WIRING EXTERNAL OF BATTERY CHARGER BOARD, SEE DRAWING # D420-223 SHEET 1 OF 2.
3. ALL DIODES ARE FD6666.
2. ALL RESISTORS IN OHMS (Ω).
1. ALL CAPACITORS IN MICROFARADS (μF).

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES | DRAWN S. REDMAN | DATE 5/9/74 | MATERIAL | FINISH | RELEASE APPROVAL | WAVETEK PROCESS | SCALE

WAVETEK SAN DIEGO, CALIFORNIA

TITLE: SCHEMATIC DIAGRAM, BATTERY CHARGER BL (1A4 TRANSMITTER)

MODEL NO. 420 | DRAWING NO. D420-210 | REV B | SHEET 1 OF 1

23338

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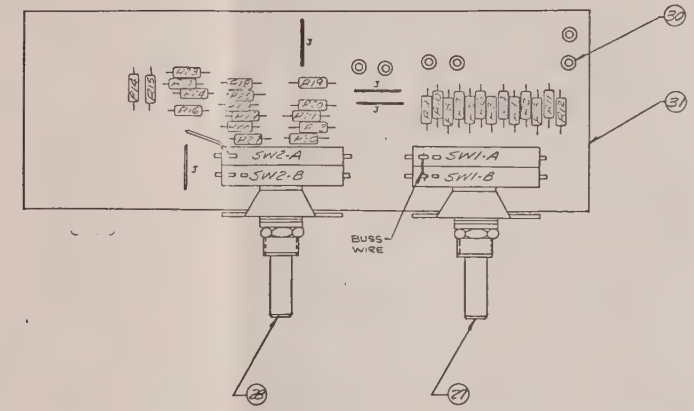

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO, CALIFORNIA
MATERIAL			TITLE ASSEMBLY ATTENUATOR (TRANSMIT T-R)
FINISH WAVETEK PROCESS	DIMENSIONS ARE IN INCHES TOLERANCES UNLESS OTHERWISE SPECIFIED ARE .XX ±.02 .XXX ±.005 ANGLES ±1°		MODEL NO. 420 DRAWING NO. D420-011 REV. H
	DO NOT SCALE DRAWING	SCALE 2:1	CAGE NO. 23338 SHEET 1 OF 2

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REV	ECN	BY	DATE	APP

PARTS LIST

LINE NO	DESCRIPTION	MFGR	FSCM	MFGR P/N	QTY
1	RESISTORS				
2	METAL FILM, 1/8W, 1%, 10Ω	CORNING	16299	RN55D	2
3	METAL FILM, 1/8W, 1%, 21.5Ω	CORNING	16299	RN55D	1
4	METAL FILM, 1/8W, 1%, 39.2Ω	CORNING	16299	RN55D	2
5	METAL FILM, 1/8W, 1%, 46.4Ω	CORNING	16299	RN55D	1
6	METAL FILM, 1/8W, 1%, 54.9Ω	CORNING	16299	RN55D	1
7	METAL FILM, 1/8W, 1%, 90.9Ω	CORNING	16299	RN55D	1
8	METAL FILM, 1/8W, 1%, 124Ω	CORNING	16299	RN55D	1
9	METAL FILM, 1/8W, 1%, 150Ω	CORNING	16299	RN55D	1
10	METAL FILM, 1/8W, 1%, 182Ω	CORNING	16299	RN55D	1
11	METAL FILM, 1/8W, 1%, 200Ω	CORNING	16299	RN55D	2
12	METAL FILM, 1/8W, 1%, 249Ω	CORNING	16299	RN55D	1
13	METAL FILM, 1/8W, 1%, 274Ω	CORNING	16299	RN55D	2
14	METAL FILM, 1/8W, 1%, 301Ω	CORNING	16299	RN55D	3
15	METAL FILM, 1/8W, 1%, 316Ω	CORNING	16299	RN55D	1
16	METAL FILM, 1/8W, 1%, 332Ω	CORNING	16299	RN55D	2
17	METAL FILM, 1/8W, 1%, 464Ω	CORNING	16299	RN55D	1
18	METAL FILM, 1/8W, 1%, 499Ω	CORNING	16299	RN55D	1
19	METAL FILM, 1/8W, 1%, 511Ω	CORNING	16299	RN55D	1
20	METAL FILM, 1/8W, 1%, 523Ω	CORNING	16299	RN55D	1
21	METAL FILM, 1/8W, 1%, 909Ω	CORNING	16299	RN55D	1
22	METAL FILM, 1/8W, 1%, 3.01K	CORNING	16299	RN55D	1
23	METAL FILM, 1/8W, 1%, 4.99K	CORNING	16299	RN55D	1
24	METAL FILM, 1/8W, 1%, 9.53K	CORNING	16299	RN55D	1
25					
26					
27	SWITCH ASSEMBLY	WAVETEK	23338	AA20-406	1

PARTS LIST

LINE NO	DESCRIPTION	MFGR	FSCM	MFGR P/N	QTY
28	SWITCH ASSEMBLY	WAVETEK	23338	AA20-407	1
29					
30	AMP PINS	AMP	00779	61183-2	6
31	CIRCUIT BOARD	WAVETEK	23338	420-111E	1
32					
33					
34					
35					
36					
37					
38					
39					
40					

LINE ITEM REFERENCE LIST

REF DES	P/L LINE	REF DES	P/L LINE	REF DES	P/L LINE
R1	24	R21	18		
R2	10	R22	11		
R3	22	R23	17		
R4	4	R24	14		
R5	21	R25	7		
R6	4	R26	14		
R7	13	R27	6		
R8	2	R28	14		
R9	9	R29	5		
R10	8	R30	12		
R11	25				
R12	3				
R13	2				
R14	17				
R15	15	SW1	[illegible]		
R16	19	SW2	26		
R17	11				
R18	16				
R19	16				
R20	20				

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN A. [illegible] DATE 6/1/73	WAVETEK SAN DIEGO, CALIFORNIA	
MATERIAL	ENGINEER [illegible] DATE	TITLE ASSEMBLY ATTENUATOR (TRANSMITTER)	
FINISH WAVETEK PROCESS	RELEASED [illegible] DATE		
	TOLERANCES UNLESS OTHERWISE SPECIFIED DECIMALS ANGLES ±1° .XX ±.01		
	DO NOT SCALE DRAWING	MODEL NO 420	DWG NO B420-011 REV F
	SCALE —	CAGE CODE 23338	SHEET 2 OF 2

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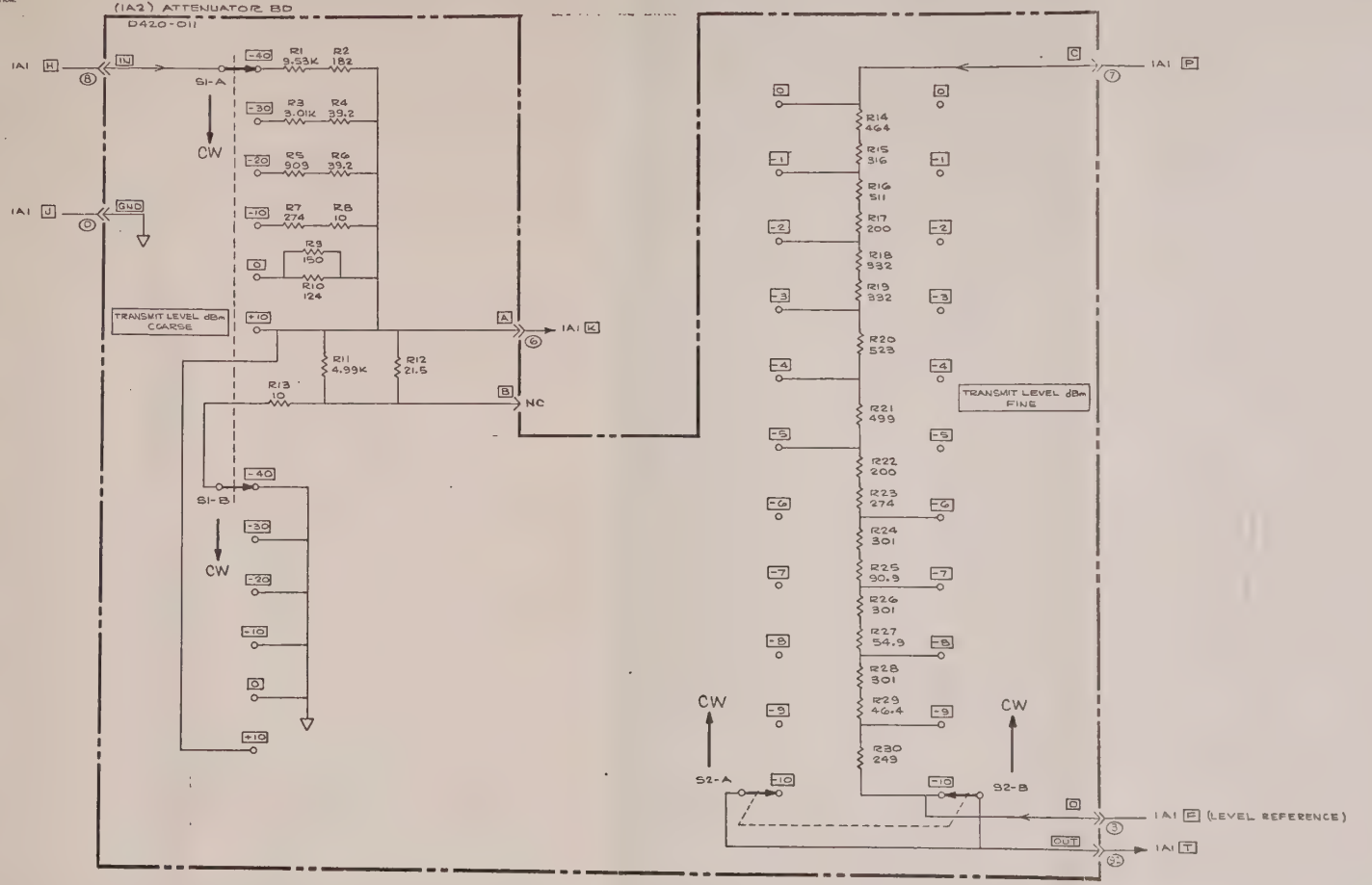
REV	ECN	BY	DATE	APP
A	SCN 999	RJ	6/29/77	



LAST REFERENCE DESIGNATIONS USED

RESISTORS —— R30

SWITCHES —— S2

2. ROTARY SWITCHES (S1 & S2) ARE SHOWN FULLY CCW AS VIEWED FROM KNOB END OF SHAFT.
1. ALL RESISTOR VALUES ARE IN OHMS (Ω).

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND SHARP EDGES	DRAWN B. Perman	DATE 5-6-76	WAVETEK SAN DIEGO, CALIFORNIA
MATERIAL	CHECKED		TITLE SCHEMATIC DIAGRAM, ATTENUATOR BD (1A2) TRANSMITTER
FINISH PER WAVETEK PROCESS	RELEASE APPROVAL	TOLERANCES UNLESS SPECIFIED XXX .010 ANGLES ±1° XX .03	
	DO NOT SCALE DWG.	SCALE	SHEET NO 420 DWG NO D420-211 REV A
			SIZE A3338 SHEET 1 OF 1

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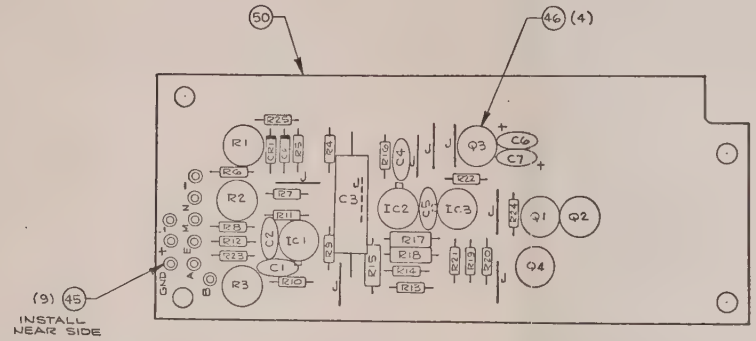
REV	ECN	BY	DATE	APP
E	# 772 773	CS	2-27-74	
F	#395	PB	10-1-74	
G	ECN 1302	JO	4-8-77	



NOTE UNLESS OTHERWISE SPECIFIED

WAVETEK SAN DIEGO • CALIFORNIA

TITLE: ASSEMBLY SWEEP GENERATOR (TRANSMITTER)

SIZE: A | DWG NO: D420-013 | REV: G

SCALE: 2 | WEIGHT: 120 | SHEET

MATERIAL

WAVETEK PROCESS

DRAWING NO. 23138

THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND DESIGN RIGHTS BELONGING TO WAVETEK AND MAY NOT BE REPRODUCED FOR ANY MAINTENANCE WITHOUT WRITTEN AUTHORIZATION

REV	ECN	BY	DATE	APP

PARTS LIST E

ILINE NO	DESCRIPTION	MFGR	FSCM	MFGR P/N	QTY
1	CAPACITORS				
2	CERAMIC DISC 220PF	CRL	71590	DD221	2
3	CERAMIC DISC .001μF	CRL	71590	DD502	2
4					
5					
6	MYLAR 100V 1μF	ELECTROCUBE	14752	210B1C105F	1
7	TANTALUM 35V 33μF	SPRAGUE	56289	196D336X9035TE4	2
8					
9					
10	DIODES				
11	DIODE 6.4V ZENER	DICKSON	12954	IN4581	2
12					
13	INTEGRATED CIRCUITS				
14	INTEGRATED CIRCUITS μA790C	FAIRCHILD	33888	μA709C (-13)	2
15	INTEGRATED CIRCUITS μA709C	FAIRCHILD	33888	μA709C (-44)	1
16					
17	POTENTIOMETERS				
18	POTENTIOMETERS 5K	BECKMAN	80740	91AR5K	1
19	POTENTIOMETERS 100K	BECKMAN	80740	91AR100K	2
20					
21					
22	RESISTORS				
23	METAL FILM 1/8W 1% 100 Ω	CORNING	16299	RN55D	2
24	METAL FILM 1/8W 1% 1.5K	CORNING	16299	RN55D	2
25	METAL FILM 1/8W 1% 3.32K	CORNING	16299	RN55D	2
26	METAL FILM 1/8W 1% 4.32K	CORNING	16299	RN55D	1
27	METAL FILM 1/8W 1% 4.99K	CORNING	16299	RN55D	1
28	METAL FILM 1/8W 1% 6.19K	CORNING	16299	RN55D	1
29	METAL FILM 1/8W 1% 10K	CORNING	16299	RN55D	6

PARTS LIST

ILINE NO	DESCRIPTION	MFGR	FSCM	MFGR P/N	QTY
30	METAL FILM 1/8W 1% 21.5K	CORNING	16299	RN55D	1
31	METAL FILM 1/8W 1% 30.1K	CORNING	16299	RN55D	1
32	METAL FILM 1/8W 1% 237K	CORNING	16299	RN55D	2
33					
34					
35	METAL FILM 1/4W 1% 49.9Ω	CORNING	16299	RN60D	2
36	METAL FILM 1/4W 1% 499K	CORNING	16299	RN60D	2
37					
38					
39	TRANSISTORS				
40	TRANSISTORS 2N3638	FAIRCHILD	33888	2N3638	2
41	TRANSISTORS 2N3642	FAIRCHILD	33888	2N3642	2
42					
43					
44					
45	AMP PINS	AMP	00779	61182-1	9
46	TRANSIPADS	MILTON ROSS	07647	10123M	4
47					
48					
49					
50	CIRCUIT BOARD	WAVETEK	21338	420-113-F	1

LINE ITEM REFERENCE LIST

REF DES	P/L LINE	REF DES	P/L LINE	REF DES	P/L LINE
C1	3	R1	18		
C2	2	R2	19		
C3	6	R3	18		
C4	3	R4	25		
C5	2	R5	25		
C6	7	R6	32		
C7	7	R7	31		
		R8	32		
CR1	11	R9	26		
CR2	11	R10	24		
		R11	30		
IC1	15	R12	28		
IC2	14	R13	28		
IC3	14	R14	29		
		R15	36		
Q1	40	R16	24		
Q2	40	R17	36		
Q3	41	R18	35		
Q4	41	R19	29		
		R20	29		
		R21	37		
		R22	25		
		R23	23		
		R24	29		
		R25	33		

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND SHARP EDGES	DRAWN E FREEMAN	DATE 5/73	WAVETEK SAN DIEGO, CALIFORNIA
MATERIAL	PROTEK/R		TITLE ASSEMBLY SWEEP GENERATOR (TRANSMITTER)
FINISH WAVETEK PROCESS	RELEASE APPROV.		
	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ± .010 ANGLES ± 1° .XX ± .030		
	DO NOT SCALE DRG. SCALE —		MODEL NO 420 DWG NO B420-013 REV G
			FSCM NO 23338 SHEET 2 OF 2

B420-013 G

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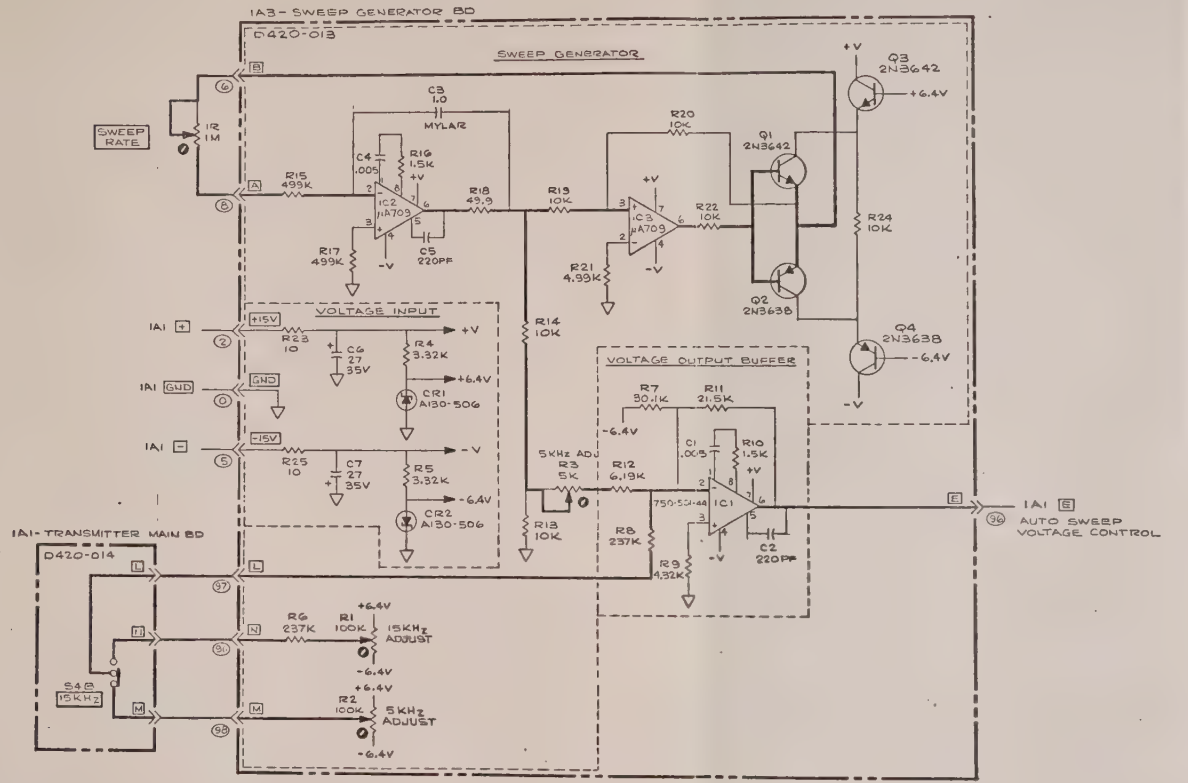
REV	ECN	BY	DATE	APP
A	ECN-471			



LAST REFERENCE DESIGNATIONS USED

CAPACITORS	C7
DIODES	CR2
INTEGRATED CIRCUITS	IC3
RESISTORS	R25
TRANSISTORS	Q4

3. SWITCH WIPERS ARE IN THE UNACTUATED (BUTTON OUT) POSITION.
2. ALL CAPACITOR VALUES ARE IN MICROFARADS (µF).
1. ALL RESISTOR VALUES ARE IN OHMS (Ω).

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND SHARP EDGES

MATERIAL —

FINISH —

WAVETEK SAN DIEGO, CALIFORNIA

SCHEMATIC DIAGRAM, SWEEP GENERATOR BD (TRANSMITTER 1A3)

MODEL NO.	DWG NO.	REV
470	D420-213	A

21338

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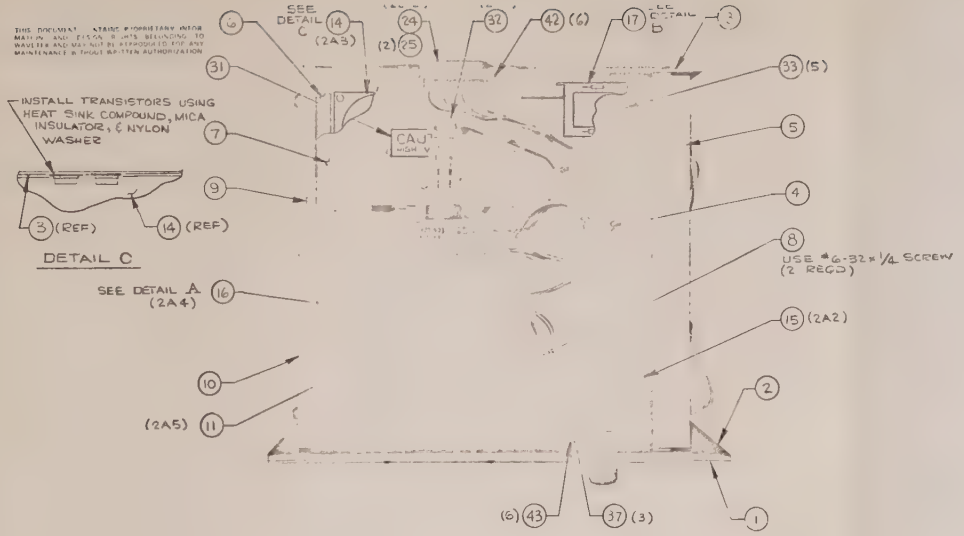
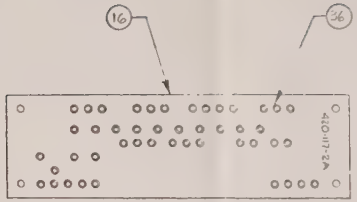
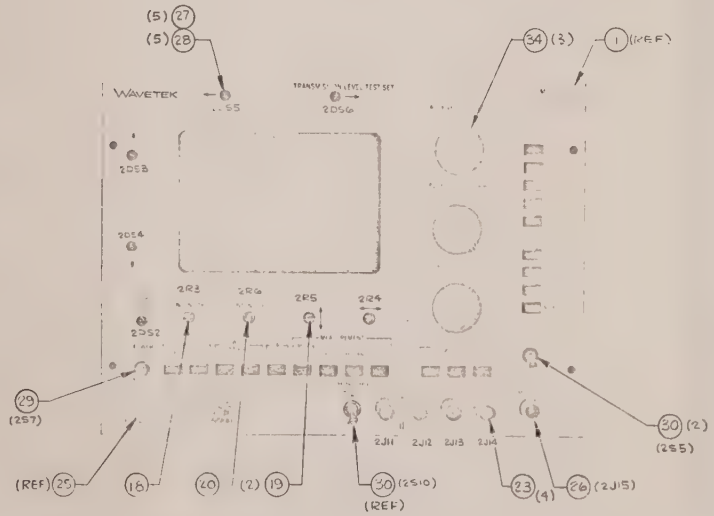
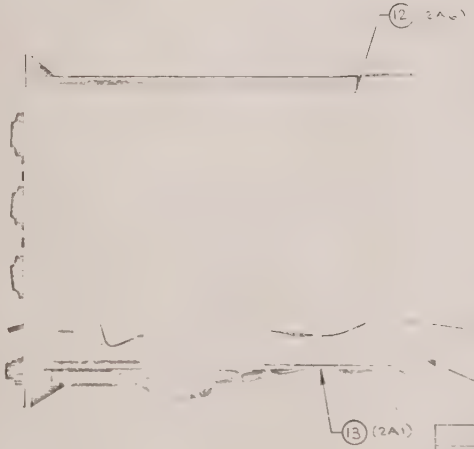
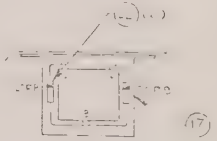

SEE DETAIL C (2A3)
SEE DETAIL B
INSTALL TRANSISTORS USING HEAT SINK COMPOUND, MICA INSULATOR, & NYLON WASHER
CAUTION HIGH V
DETAIL C
SEE DETAIL A (2A4)
USE #6-32 x 1/4 SCREW (2 REQD)
(2A5)
(2A2)









1. ALL LOCK WASHERS MUST BE SPRING (SPLIP) LOCK TYPE.

WAVETEK
ASSEMBLY,

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PARTS LIST					
LINE NO	DESCRIPTION	MFGR	FSCM	MFGR P/N	QTY
1	FRONT PANEL	WAVETEK	23338	C420-555	1
2	SUB PANEL	WAVETEK	23338	C420-303	1
3	REAR PANEL	WAVETEK	23338	C420-326	1
4	CHASSIS, HORIZ	WAVETEK	23338	D420-327	1
5	CHASSIS, VERT	WAVETEK	23338	C420-328	1
6	ENCLOSURE, H.V.	WAVETEK	23338	C420-329	1
7	COVER, ENCLOSURE	WAVETEK	23338	B420-330	1
8	BRACKET, POT MTG	WAVETEK	23338	C420-331	1
9	SUPPORT BAR	WAVETEK	23338	B420-332	1
10	SIDE PLATE	WAVETEK	23338	C420-344	1
11	CRT ASSEMBLY	WAVETEK	23338	D420-042	1
12	NOISE BOARD	WAVETEK	23338	D420-035	1
13	MAIN BOARD	WAVETEK	23338	D420-016	1
14	HIGH VOLTAGE BD	WAVETEK	23338	D420-012	1
15	ATTENUATOR BD	WAVETEK	23338	D420-020	1
16	INTERFACE BOARD	WAVETEK	23338	420-117A	1
17	HOLDING COIL	WAVETEK	23338	B420-525	1
18	POTENTIOMETER 100Ω	WAVETEK	23338	A420-522	1
19	POTENTIOMETER 10K	WAVETEK	23338	A420-523	2
20	POTENTIOMETER 100K	WAVETEK	23338	A420-524	1
21					
22	DIODE, ZENER	I.R.	81483	IN4744	2
23	BINDING POST	SUPERIOR	58474	DF21BC	4
24	CONNECTOR	CANNON	31746	DBC-25P	1
25	SPRING LATCH ASSY	CANNON	31746	D110277	2
26	PHONE JACK	SWITCH CRAFT	82389	MT-332B	1
27	LED	OPCOA		OSL-6L-1	5
28	LED MTG KIT	OPCOA		OC1	5
29	SWITCH DPDT	C & K	09353	7201-PDCN	1

PARTS LIST					
LINE NO	DESCRIPTION	MFGR	FSCM	MFGR P/N	QTY
30	SWITCH SPDT	C & K	09353	7101-PDCN	2
31	LABEL, CAUTION	BRADY	85480	8513472-1	1
32	TUBE SOCKET (7 PIN)	INTERNATIONAL IMPORTS		57-502B	1
33	GROMMET	H.H. SMITH	83330	2175	5
34	KNOB, SKIRTED BAR	RAYTHEON	94144	70B-3-2G	3
35	SPEED NUT	TINNERMAN	78553	CB80-632	17
36	AMP PIN (MALE)	AMP	00779	61182-2	46
37	PRESS BOLT	ROSAN	83324	PB6-325M-10	3
38	STANDOFF	USECO	98245	1531 A 3/4 - 11	7
39					
40					
41	SCREW, SELF LOCKING 86-32 X 5/16	LONG-LOK	16941	LP-35206-227	19
42	NUT, SELF LOCKING 84-40	SPS	56878	21-FA-440	6
43	NUT, SELF LOCKING 86-32	SPS	56878	21-FA-632	6

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES

MATERIAL

FINISH WAVETEK PROCESS

DRAWN D. REDMAN

APVD A. GUST 3/4 5/77

RELEASE APPVD

TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 ANGLES ± 1 XX ± .030

ENGINEER

PLATE

WAVETEK SAN DIEGO, CALIFORNIA

TITLE ASSEMBLY, RECEIVER

MODEL NO 420

DWG NO B420-002

REV E

23338

SHEET 2 OF 2

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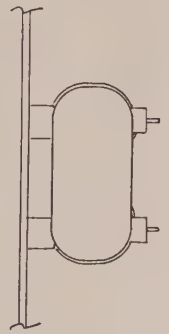
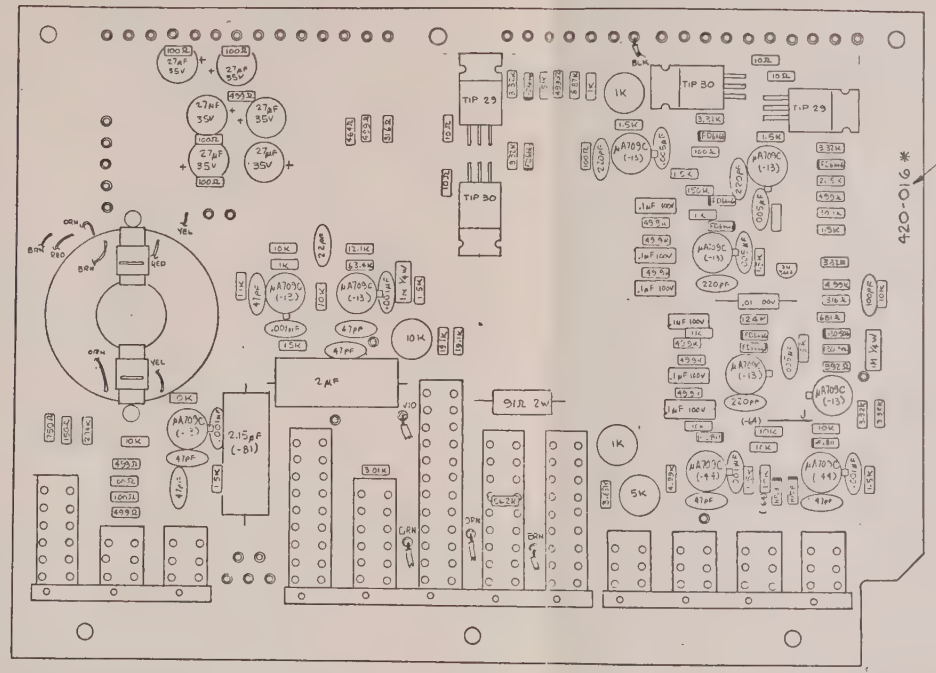
REV	ECN	BY	DATE	APP
L	ECN 13388	B.R.	2/18/14	RTW





NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO, CALIFORNIA
MATERIAL			TITLE ASSEMBLY MAIN BOARD (RECEIVER)
FINISH BAKELITE PROCESS			SIZE A4 DRAWING NO. D420-016 REV L
			SCALE 2/1 WEIGHT 23138 SHEET 1 OF 2

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PARTS LIST

ITEM NO	DESCRIPTION	MFGR	FSCM	MFGR P/N	QTY
1	CAPACITORS				
2	CERAMIC DISC, 22PF	CRL	71590	DD220	1
3	CERAMIC DISC, 47PF	CRL	71590	DD470	7
4	CERAMIC DISC, 100PF	CRL	71590	DD101	1
5	CERAMIC DISC, 220PF	CRL	71590	DD221	4
6					
7					
8	CERAMIC DISC, 1000V, .001uF	CRL	71590	DD102	5
9	CERAMIC DISC, 50V, .005uF	CRL	71590	CK502	4
10	MYLAR, 100V, .01uF	IMB	27536	PA2B103F	1
11	MYLAR 100V .1uF	SPRAGUE	56289	225PW	6
12					
13	MYLAR 200V, 10% 2uF	AMERICAN RADIONICS	07994	WVTK 2MPW-205K	1
14	TANTALUM 35V, 33uF	SPRAGUE	56289	196D336X9035TE4	6
15	MYLAR 200V 3% 2.15uF	AMERICAN RADIONICS	07994	WAVETEK 2MPW - 205K (-81)	1
16					
17					
18					
19	DIODES				
20	FD6666	FAIRCHILD	33888	FD6666	8
21	6.4V ZENER	DICKSON	12954	IN4581(130-506)	2
22					
23	HP2811	HEWLETT PACKARD		5082-2811	4
24					
25					
26					
27	INTEGRATED CIRCUITS				
28	µA709C	FAIRCHILD	33888	UA709C (-13)	6
29	µA709C	FAIRCHILD	33888	µA709C (-44)	2
30					
31					
32	POTENTIOMETERS				
33					
34	1K	BECKMAN	80740	91AR1K	2
35	5K	BECKMAN	80740	91AR5K	1
36	10K	BECKMAN	80740	91AR10K	1
37					
38					
39	RESISTORS				
40	METAL FILM, 1/8W, 1%, 100Ω	CORNING	16299	RN55D	4
41	METAL FILM, 1/8W, 1%, 31.6Ω	CORNING	16299	RN55D	1
42	METAL FILM, 1/8W, 1%, 100Ω	CORNING	16299	RN55D	8
43	METAL FILM, 1/8W, 1%, 150Ω	CORNING	16299	RN55D	1
44	METAL FILM, 1/8W, 1%, 316Ω	CORNING	16299	RN55D	1
45	METAL FILM, 1/8W, 1%, 464Ω	CORNING	16299	RN55D	1
46	METAL FILM, 1/8W, 1%, 499Ω	CORNING	16299	RN55D	6
47	METAL FILM, 1/8W, 1%, 681Ω	CORNING	16299	RN55D	1
48	METAL FILM, 1/8W, 1%, 750Ω	CORNING	16299	RN55D	1
49	METAL FILM, 1/8W, 1%, 8.87K	CORNING	16299	RN55D	1
50	METAL FILM, 1/8W, 1%, 15.0K	CORNING	16299	RN55D	1
51	METAL FILM, 1/8W, 1%, 1.00K	CORNING	16299	RN55D	4
52	METAL FILM, 1/8W, 1%, 1.10K	CORNING	16299	RN55D	1
53	METAL FILM, 1/8W, 1%, 1.21K	CORNING	16299	RN55D	1
54	METAL FILM, 1/8W, 1%, 1.50K	CORNING	16299	RN55D	12
55	METAL FILM, 1/8W, 1%, 3.01K	CORNING	16299	RN55D	1
56	METAL FILM, 1/8W, 1%, 3.32K	CORNING	16299	RN55D	7
57	METAL FILM, 1/8W, 1%, 3.65K	CORNING	16299	RN55D	1

PARTS LIST

ITEM NO	DESCRIPTION	MFGR	FSCM	MFGR P/N	QTY
58	METAL FILM, 1/8W, 1%, 4.99K	CORNING	16299	RN55D	2
59	METAL FILM, 1/8W, 1%, 10.0K	CORNING	16299	RN55D	8
60	METAL FILM, 1/8W, 1%, 12.1K	CORNING	16299	RN55D	1
61	METAL FILM, 1/8W, 1%, 21.5K	CORNING	16299	RN55D	1
62	METAL FILM, 1/8W, 1%, 19.1K	CORNING	16299	RN55D	2
63	METAL FILM, 1/8W, 1%, 30.1K	CORNING	16299	RN55D	1
64	METAL FILM, 1/8W, 1%, 49.9K	CORNING	16299	RN55D	6
65	METAL FILM, 1/8W, 1%, 63.4K	CORNING	16299	RN55D	1
66	METAL FILM, 1/8W, 1%, 150K	CORNING	16299	RN55D	2
67	METAL FILM, 1/8W, 1%, MATCHED 10.0K	CORNING	16299	RN55D (-64)	2
68	METAL FILM, 1/8W, 1%, 56.2K	CORNING	16299	RN55D	1
69	METAL FILM, 1/8W, 1%, 332Ω	CORNING	16299	RN55D	1
70	METAL FILM 1/4W, 1% 1M	CORNING	16299	RN60D	2
71	CARBON, 2W, 5%, 91Ω	STACKPOLE	29604	RC42GF 910J	1
72	METAL FILM 1/8W, 1%, 2.74K	CORNING	16299	RN55D	1
73					
74					
75					
76					
77	TRANSISTORS				
78	2N3642	FAIRCHILD	33888	2N3642	1
79	TIP 29	T.I.	01295	TIP 29	2
80	TIP 30	T.I.	01295	TIP 30	2
81					
82					
83					
84	TRANSFORMER 61228	WAVETEK	23338	8420-509	1
85					
86					
87					
88	SWITCHES				
89	SWITCH ASSY	WAVETEK	23338	8420-402	1
90	SWITCH ASSY	WAVETEK	23338	8420-401	1
91	SWITCH ASSY	WAVETEK	23338	8750-400	2
92					
93					
94	AMP PINS (FEMALE)	AMP	00779	60598-8	5
95	AMP PINS (MALE)	AMP	00779	61182-2	49
96	TRANSISTOR PAD	MILTON ROSS	07047	10123N	1
97	CONNECTOR	CANNON	71468	DBC25S	1
98					
99	SNAGE STANDOFF	AMOTOM	06540	9533B-8-0440-3A	6
100	TIE STRAP	PANDUIT	06383	SST-1.5M	2
101					
102					
103	MTG BLOCK	PANDUIT	06383	TM-256C	2
104					
105	CIRCUIT BOARD	WAVETEK	23338	420-116D	1

NOTE UNLESS OTHERWISE SPECIFIED

LINE ITEM REFERENCE LIST

REF DES	P/L LINE
C1	36
C2	34
C3	35
C4	34
C5	46
C6	48
C7	42
C8	43
C9	46
C10	42
C11	39
C12	54
C13	59
C14	45
C15	46
C16	41
C17	51
C18	52
C19	54
C20	59
C21	55
C22	72
C23	60
C24	58
C25	54
C26	65
C27	70
C28	62
C29	62
C30	62
C31	42
C32	71
C33	42
C34	42
C35	56
C36	56
C37	70
	47
	44
	58
CR1	56
CR2	64
CR3	64
CR4	64
CR5	66
CR6	54
CR7	53
CR8	67
CR9	58
CR10	54
CR11	59
CR12	67
CR13	54
CR14	59
IC1	64
IC2	64
IC3	64
IC4	66
IC5	54
IC6	57
IC7	54
IC8	63
IC9	54
IC10	54
IC11	42
IC12	56
	56
	40
Q1	48
Q2	61
Q3	46
Q4	46
Q5	51
	49
	50

REF DES	P/L LINE
R1	36
R2	34
R3	35
R4	34
R5	46
R6	48
R7	42
R8	43
R9	46
R10	42
R11	39
R12	54
R13	59
R14	45
R15	46
R16	41
R17	51
R18	52
R19	54
R20	59
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R25	54
R26	65
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R31	42
R32	71
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R38	47
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R42	64
R43	64
R44	64
R45	66
R46	54
R47	53
R48	67
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R52	67
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R61	54
R62	63
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R65	42
R66	56
R67	56
R68	40
R69	48
R70	61
R71	46
R72	46
R73	51
R74	49
R75	50
R76	54
R77	54
R78	42
R79	56
R86	56
R81	40
R82	40
R83	46
R84	43
R85	68
R86	59
SW1	47
SW2	89
SW3	89
SW4	91
SW5	91
SW6	90
SW7	90
SW8	90
SW9	89
SW10	89
SW11	91
SW12	91
T1	84
(87)	61
(88)	81

REV	ECN	BY	DATE	APP

REMOVE ALL BURRS AND BREAK SHARP EDGES

MATERIAL

FINISH WAVETEK PROCESS

DRAWN S.C.A. 3-1-73

ENGR M.G. JUSTICE 3-1-73

RELEASE APPR.

TOLERANCE UNLESS OTHERWISE SPECIFIED .XX ± .010 .XXX ± .005 ANGLES ± 1°

DO NOT SCALE

SCALE —

WAVETEK SAN DIEGO, CALIFORNIA

TITLE ASSEMBLY MAIN BOARD (RECEIVER)

MODEL NO 420

DWG NO B420-016

REV L

CAGE 23338

SHEET 2 OF 2

B420-016 L

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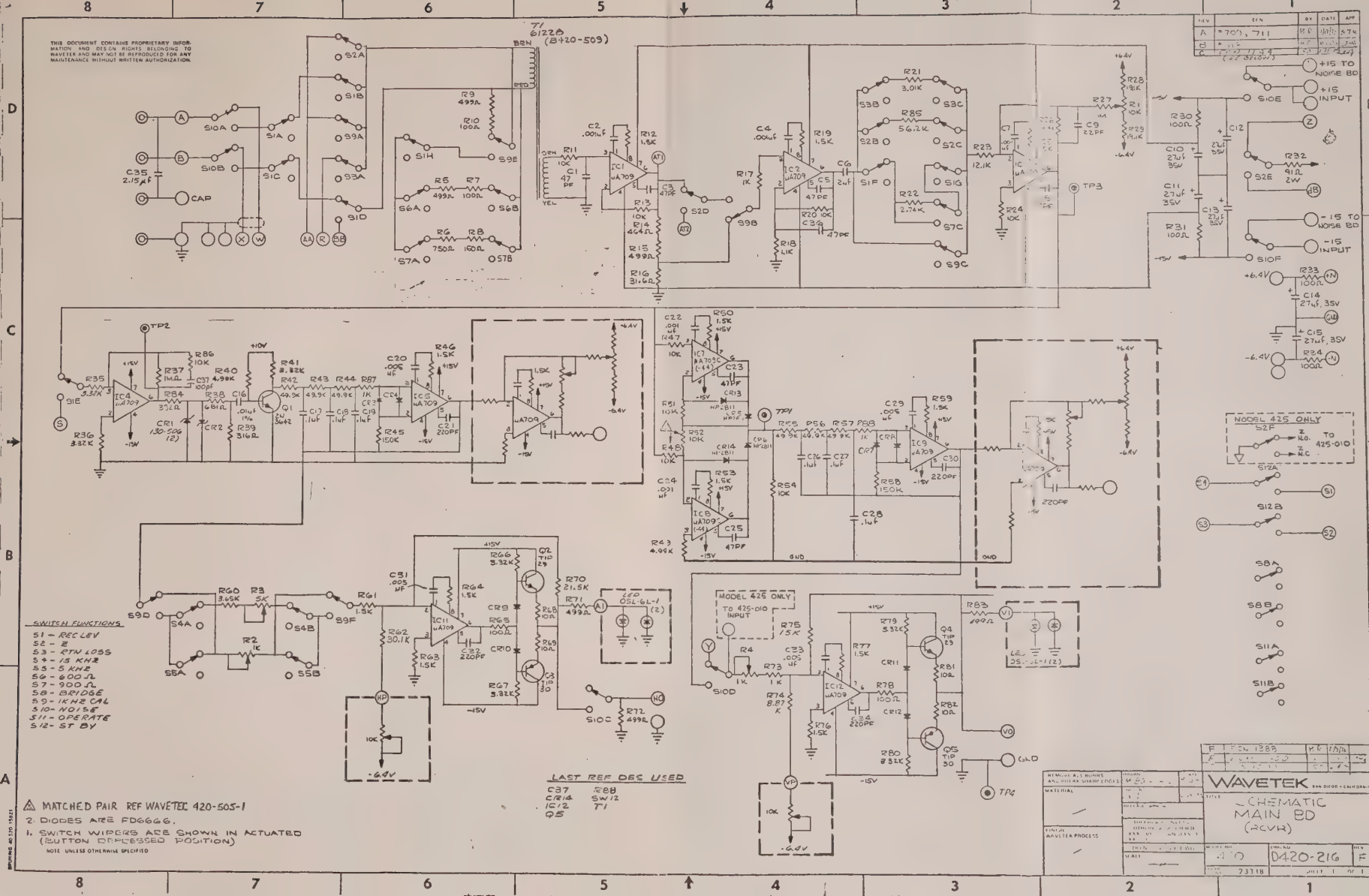

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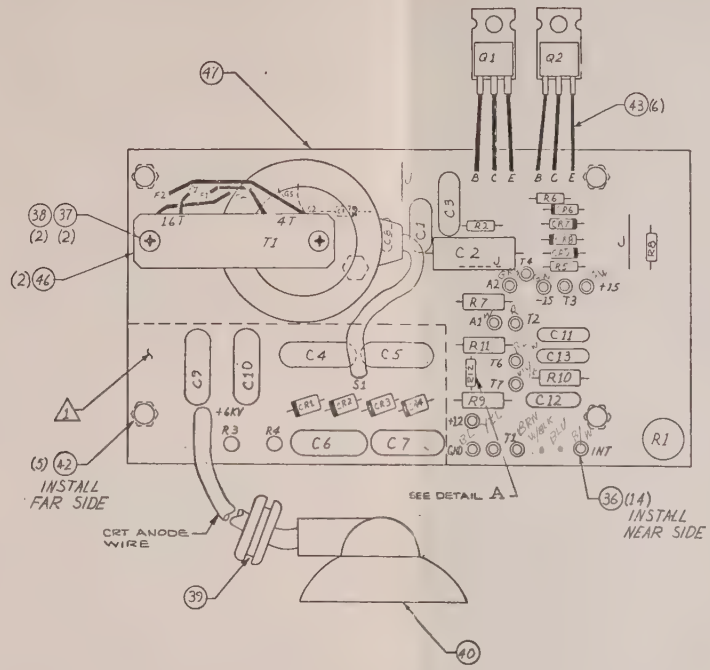
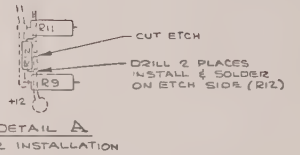
REV	ECN	BY	DATE	APP
E	# 763	BA		
F	# 772, 777	BA		
G	# 780	BA		
H	# 720	BA		
J	ECN 915B	BA		
K	# 958	BA		
L	# 1117	BA		





DETAIL A
R12 INSTALLATION

2 SELECT R8 VALUE AT TEST (15K TO 30.1K) FOR 70mA DC ±5mA WITH A CRT BEING POWERED BY THIS BOARD.

1 APPLY SILICONE RUBBER (ITEM 41) TO INDICATED AREA. MINIMUM THICKNESS 1/16" ON BOTH SIDES OF CIRCUIT BOARD. ENCAPSULATE ALL COMPONENTS; HEAVY BUILD UP REQUIRED AT BASE OF 4KV OUTPUT (CRT ANODE WIRE).

NOTE UNLESS OTHERWISE SPECIFIED

WAVETEK SAN DIEGO, CALIF.

ASSEMBLY
HIGH VOLTAGE SUPPLY

D420 012

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REV	ECN	BY	DATE	APP

PARTS LIST

LINE NO	DESCRIPTION	MFGR	FSCM	MFGR P/N	QTY
1	CAPACITORS				
2	CERAMIC DISC .001μF	CRL	71590	00102	1
3	CERAMIC DISC 6KV 470PF	SPRAGUE	56289	60GA-747	6
4	GAP CAP 1.5KV .01μF	CRL	71590	GAP-103	3
5	MYLAR 50V .22μF	TRW	84411	601PE	1
6	TANTALUM 35V 33μF	SPRAGUE	56289	1960336X9035TE4	1
7	MYLAR 200V .33μF	TRW	84411	X663F	1
8					
9					
10	DIODES				
11	FDH6666	FAIRCHILD	33888	FDH6666	4
12	SCM30	SEMTECH	14099	SCM-30	4
13	IN4005	G.I.	15281	IN4005	1
14					
15					
16	POTENTIOMETERS				
17	POTENTIOMETERS 100K	BECKMAN	80747	91AR100K	1
18					
19	RESISTORS				
20	METAL FILM 1/8W, 1% 24.9Ω	CORNING	16299	RN55D	1
21	METAL FILM 1/8W, 1% 4.75K	CORNING	16299	RN55D	1
22	METAL FILM 1/8W, 1% [2]	CORNING	16299	RN55D	1
23	METAL FILM 1/8W, 1% 56.2K	CORNING	16299	RN55D	1
24	METAL FILM L/8W, 1% 10.0Ω	CORNING	16299	RN55D	1
25					
26	METAL FILM 1/4W, 1% 1M	CORNING	16299	RN60D	6
27					
28	TRANSFORMER	WAVETEK	23338	B420-502	1
29					

PARTS LIST

LINE NO	DESCRIPTION	MFGR	FSCM	MFGR P/N	QTY
30	TRANSISTOR				
31	TIP 29	T.I.	01295	TIP29	1
32	TIP 30	T.I.	01295	TIP30	1
33					
34					
35					
36	AMP PIN	AMP	00779	61182-1	14
37	SCREW 84-40 X 2 PAN HEAD			COML	2
38	NUT, SELF LOCKING	SPS	56878	21FA-440	2
39	GROMMET	H.H. SMITH	83330	2173	1
40	HIGH VOLTAGE CABLE	INTER IMPORTERS		CB-508R	1
41	SILICONE RUBBER	DOW CORNING	71984	3140	AR
42	STANDOFF, HEX, SWAGE	USECO	88245	1531-B-3/8	5
43	WIRE, TEFLON 1 1/2" LONG (BLK)	NATIONAL	04569	NE1934U	6
44					
45					
46	BRACKET, XFMR	WAVETEK	23338	A420-348	2
47	CIRCUIT BOARD	WAVETEK	23338	420-112M	1

LINE ITEM REFERENCE LIST

REF DES	P/L LINE
C1	6
C2	7
C3	5
C4	3
C5	3
C6	3
C7	3
C8	2
C9	3
C10	3
C11	4
C12	4
C13	4
CR1	12
CR2	12
CR3	12
CR4	12
CR5	13
CR6	11
CR7	11
CR8	11
CR9	11
Q1	31
Q2	32

REF DES	P/L LINE
R1	17
R2	21
R3	24
R4	26
R5	22
R6	20
R7	26
R8	25
R9	26
R10	26
R11	26
R12	24
T1	28

REF DES	P/L LINE

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN G. TROMBLEY	DATE 4-10	WAVETEK SAN DIEGO, CALIFORNIA
MATERIAL	ENGINEER		TITLE ASSEMBLY HIGH VOLTAGE SUPPLY
FINISH WAVETEK PROCESS	RELEASE APPROVAL		
	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 .XX ±.03 ANGLES ±1°		
	COMPUTER DATA		MODEL NO 420 DWG NO B420-012 REV L
	SCALE —		CAGE 23338 SHEET 2 OF 2

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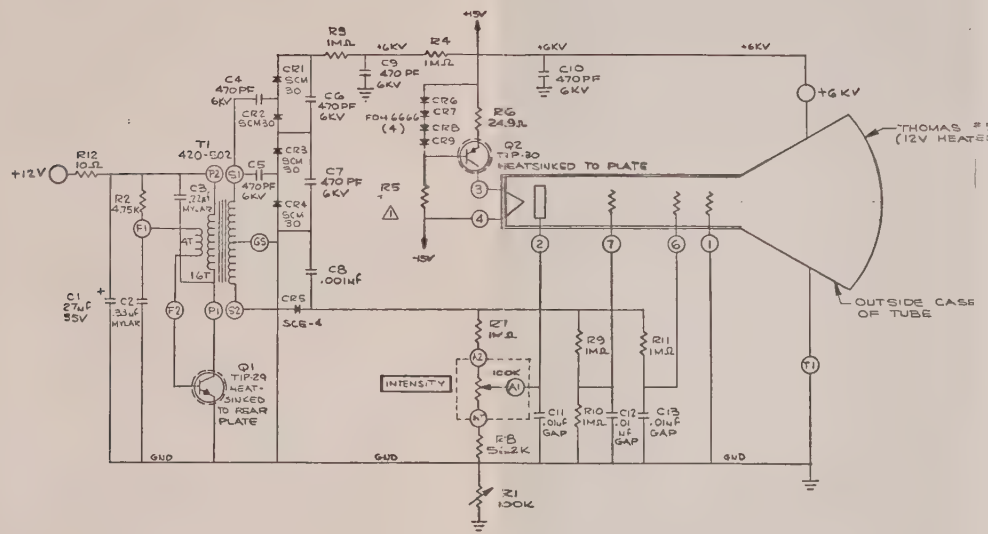
REV	ECN	BY	DATE	APP
A	# 775			
B	# 1058			
C	# 1117	BP	4/5/74	



CRT
Wavetek Pt # 5700-00-0001

LAST REF. DESIG USED: C13, CR9, Q2, R12, T1

⚠ R5 VALUE TO BE SELECTED @ TEST (15K TO 20.1K) FOR 70ma DC ±5ma WITH A CRT BEING POWERED BY THIS BOARD.

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES
MATERIAL
FINISH
MASTER PROCESS
DRAWN
TOLERANCES
NEXT ASSY
APPLICATION
WAVETEK SAN DIEGO, CALIFORNIA
TITLE: HIGH VOLTAGE CRT POWER SUPPLY (6KV)
SIZE: A
DRAWING NO: D420-312
REV: C
SCALE:
WEIGHT:
SHEET 1 OF 1
420
23338

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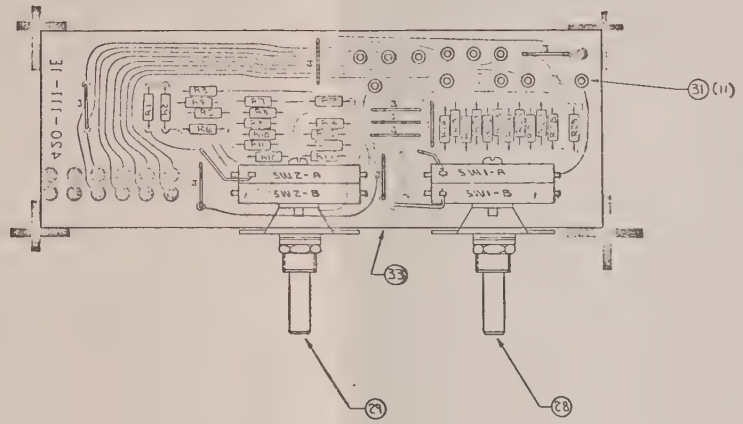

NOTE UNLESS OTHERWISE SPECIFIED

WAVETEK

ASSEMBLY
ATTENUATOR
(2A2) RECEIVER

470

D 460 027

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REV	LTR	BY	DATE	APP

PARTS LIST

LINE NO	DESCRIPTION	MFGR	FSCM	MFGR P/N	QTY
1	RESISTOR				
2	METAL FILM, 1/8W, 1%, 100	CORNING	16299	RN55D	2
3	METAL FILM, 1/8W, 1%, 21.5Ω	CORNING	16299	RN55D	1
4	METAL FILM, 1/8W, 1%, 39.2Ω	CORNING	16299	RN55D	2
5	METAL FILM, 1/8W, 1%, 46.4Ω	CORNING	16299	RN55D	1
6	METAL FILM, 1/8W, 1%, 54.9Ω	CORNING	16299	RN55D	1
7	METAL FILM, 1/8W, 1%, 90.9Ω	CORNING	16299	RN55D	1
8	METAL FILM, 1/8W, 1%, 124Ω	CORNING	16299	RN55D	1
9	METAL FILM, 1/8W, 1%, 150Ω	CORNING	16299	RN55D	1
10	METAL FILM, 1/8W, 1%, 182Ω	CORNING	16299	RN55D	1
11	METAL FILM, 1/8W, 1%, 200Ω	CORNING	16299	RN55D	2
12	METAL FILM, 1/8W, 1%, 249Ω	CORNING	16299	RN55D	1
13	METAL FILM, 1/8W, 1%, 274Ω	CORNING	16299	RN55D	2
14	METAL FILM, 1/8W, 1%, 301Ω	CORNING	16299	RN55D	3
15	METAL FILM, 1/8W, 1%, 316Ω	CORNING	16299	RN55D	1
16	METAL FILM, 1/8W, 1%, 332Ω	CORNING	16299	RN55D	2
17	METAL FILM, 1/8W, 1%, 464Ω	CORNING	16299	RN55D	1
18	METAL FILM, 1/8W, 1%, 499Ω	CORNING	16299	RN55D	1
19	METAL FILM, 1/8W, 1%, 511Ω	CORNING	16299	RN55D	1
20	METAL FILM, 1/8W, 1%, 523Ω	CORNING	16299	RN55D	1
21	METAL FILM, 1/8W, 1%, 909Ω	CORNING	16299	RN55D	1
22	METAL FILM, 1/8W, 1%, 3.01K	CORNING	16299	RN55D	1
23	METAL FILM, 1/8W, 1%, 9.53K	CORNING	16299	RN55D	1
24					
25					
26					
27					
28	SWITCH ASSEMBLY	WAVETEK	23338	A420-406	1
29	SWITCH ASSEMBLY	WAVETEK	23338	A420-407	1

PARTS LIST

LINE NO	DESCRIPTION	MFGR	FSCM	MFGR P/N	QTY
30					
31	AMP PINS	AMP	00779	61182-2	11
32					
33	CIRCUIT BOARD	WAVETEK	23338	420-111	1
34					

LINE ITEM REFERENCE LIST

REF DES	P/L LINE	REF DES	P/L LINE	REF DES	P/L LINE
R1	17				
R2	15				
R3	13				
R4	11				
R5	14				
R6	19				
R7	16				
R8	7				
R9	14				
R10	5				
R11	14				
R12	6				
R13	16				
R14	20				
R15	18				
R16	11				
R17	12				
R18	9				
R19	8				
R20	2				
R21	13				
R22	21				
R23	4				
R24	22				
R25	4				
R26	23				
R27	10				
R28	2				
R29	3				
SW1	28				
SW2	29				

NOTE UNLESS OTHERWISE SPECIFIED

MATERIAL		WAVETEK SAN DIEGO, CALIFORNIA	
MATERIAL PROCESS		TITLE: ASSEMBLY ATTENUATOR (2A2) RECEIVER	
		SIZE: A	DWG NO: B420-022
		SCALE: 4:1	CAGE: 23338

ALL RIGHTS RESERVED

D420-022 A

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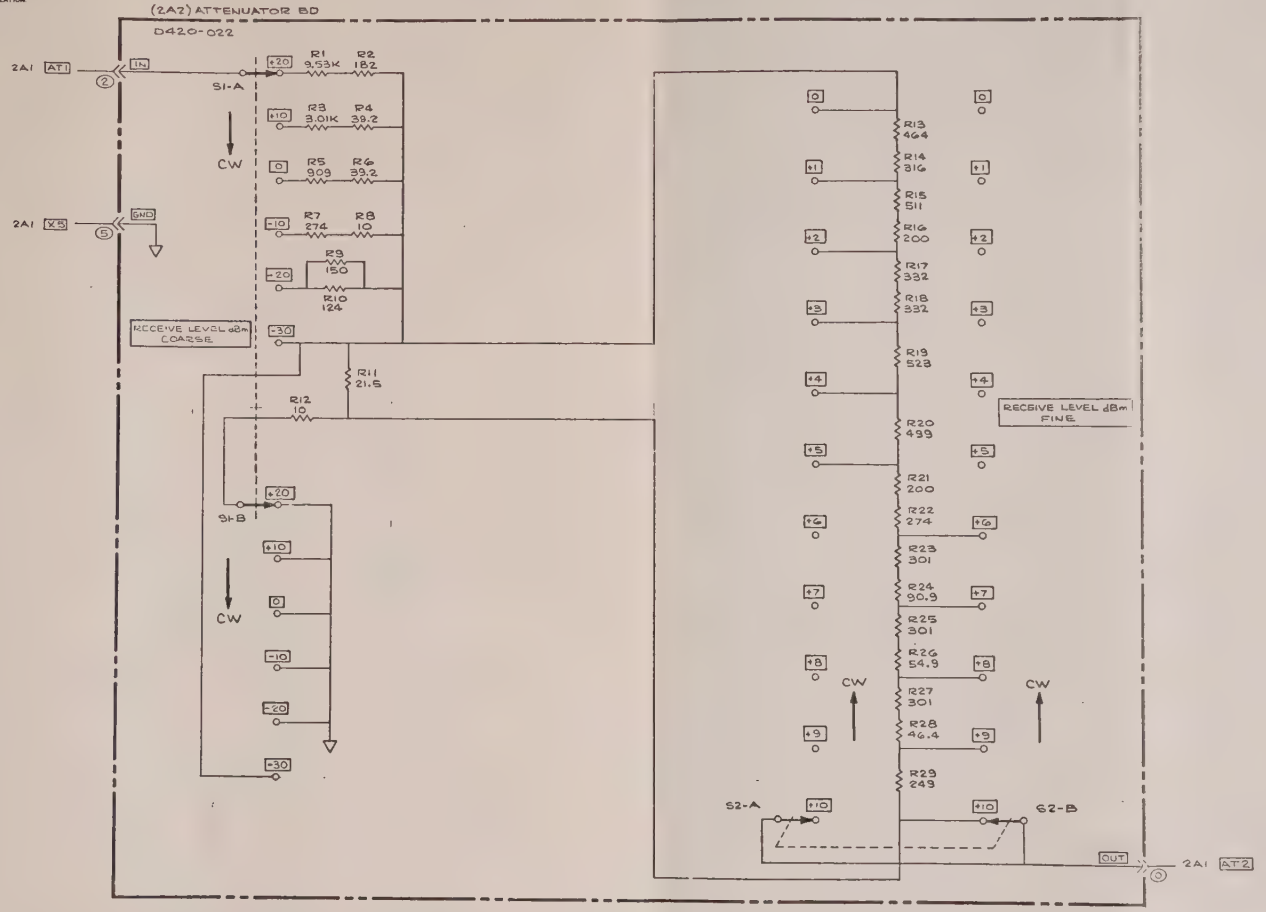
REV	ECN	BY	DATE	APP



LAST REFERENCE DESIGNATIONS USED

RESISTORS — R29
SWITCHES — S2

2. ROTARY SWITCHES (S1 & S2) ARE SHOWN FULLY CCW AS VIEWED FROM KNOB END OF SHAFT.
1. ALL RESISTOR VALUES ARE IN OHMS (Ω).

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES

MATERIAL

FINISH

DO NOT SCALE DRAWING

WAVETEK SAN DIEGO, CALIFORNIA

SCHEMATIC DIAGRAM, ATTENUATOR BD (2A2) RECEIVER

420 D420-222

23338

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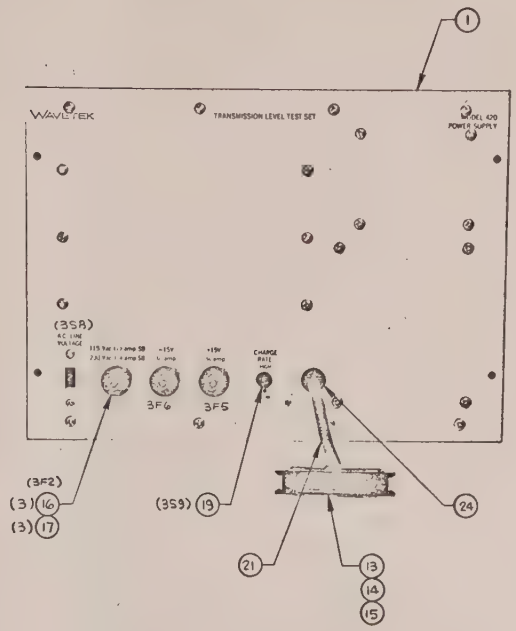
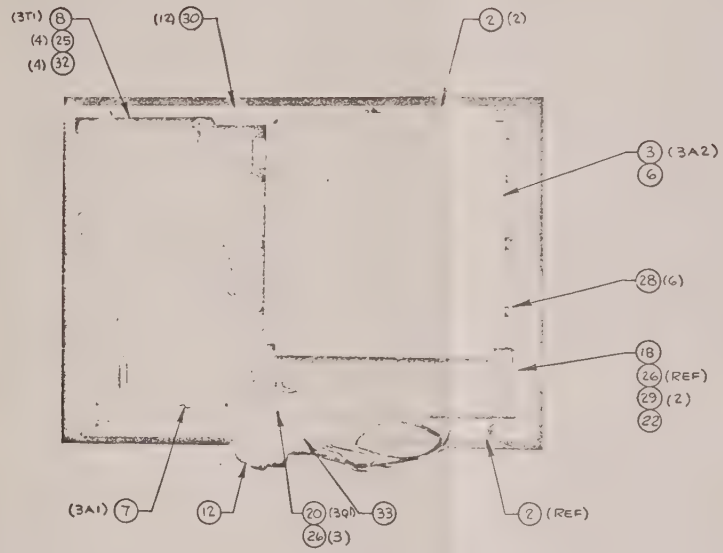
REV	ECN		
A	773 781		
B	*987, 1053		
C	ECN 1294		





INSTALL TRANSISTOR USING HEAT SINK COMPOUND, MICA INSULATOR & NYLON SHOULDER WASHER

NOTE UNLESS OTHERWISE SPECIFIED

MATERIAL	DRAWN	WAVETEK
FINISH		ASSEMBLY, POWER SUPPLY (RECEIVER)
NEXT ASSY		
DO NOT SCALE DRAWING		
	NONE	420 D420-003 C
		2333R SHEET 1 OF 2

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REV	ECN

PARTS LIST

LINE NO	DESCRIPTION	MFGR	FSCM	MFGR P/N	QTY
1	FRONT PANEL	WAVETEK	23338	C420-304	1
2	SUPPORT ANGLE	WAVETEK	23338	B420-347	2
3	BATTERY HOLDER	WAVETEK	23338	C420-334	1
4					
5					
6	BATTERY ASSY	WAVETEK	23338	C420-005	1
7	BATTERY CHARGER BD	WAVETEK	23338	D420-021	1
8	TRANSFORMER	WAVETEK	23338	B420-527	1
9					
10					
11					
12	A.C. RECPTACLE	SWITCHCRAFT	82389	EAC-301	1
13	CONNECTOR	CANNON	31746	DBC-25S	1
14	JUNCTION SHELL	CANNON	31746	DBS1212-1	1
15	END DISC LATCH	CANNON	31746	D110278	1
16	FUSE HOLDER	LITTLEFUSE	75915	345001	3
17	FUSE, 1/2 AMB SLO BLO	LITTLEFUSE	75915	313.500	3
18	SWITCH 115/230	SWITCHCRAFT	82389	46256LF	1
19	SWITCH SPST	C&K	09353	7101-PDCN	1
20	TRANSISTOR TIP 30	T.I.	01295	TIP-30	1
21	CABLE, 12 CONDUCTOR	BELDEN	16428	8457-100	22"
22	GUARD, SOLDER	SWITCHCRAFT	82389	46256-LF-SG	1
23					
24	GROMMET	H.H. SMITH	83330	91117	1
25	SPACER	H.H. SMITH	83330	8713	4
26					
27					
28	SPEED NUT	TINNERMAN	78553	CB80-632	6
29	NUT, SELF LOCKING 84	SPS	36878	21-PA-440	2

PARTS LIST

LINE NO	DESCRIPTION	MFGR	FSCM	MFGR P/N	QTY
30	NUT, SELF LOCKING 86	SPS	36878	21-PA-632	12
31					
32	SCREW, 86-32 X 3" LONG	COML			4
33	SOLDER LUG	H.H. SMITH	83330	1414-4	1

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES

MATERIAL

FINISH PER VETEER PROCESS

DRAWN: D. COLOMA

ENGINEER

RELEASE APPR.

TOLERANCE UNLESS OTHERWISE SPECIFIED: XXX ± .010, XX ± .030, ANGLES ± 1

DO NOT SCALE DWG

SCALE

WAVETEK SAN DIEGO, CALIFORNIA

TITLE: ASSEMBLY, POWER SUPPLY (RECEIVER)

MODEL NO: 420

DWG NO: B420-0003

REV: C

CAGE: 23338

SHEET 2 OF 2

B420-0003 B

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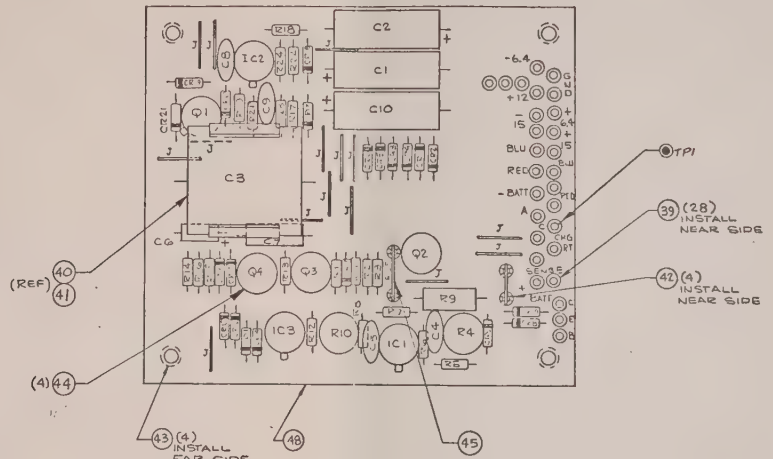
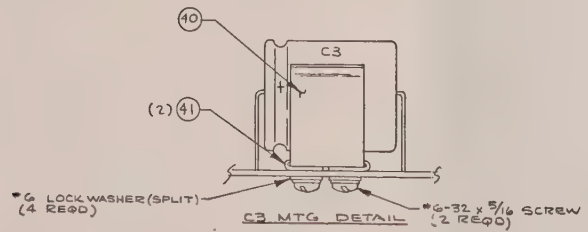
REV	ECN	BY	DATE	APP
C	ECN 722	[illegible]	[illegible]	[illegible]
D	ECN 911	[illegible]	[illegible]	[illegible]
E	ECN 936	[illegible]	[illegible]	[illegible]
F	ECN 950	[illegible]	[illegible]	[illegible]
G	ECN 1249	[illegible]	[illegible]	[illegible]
H	ECN 1304	[illegible]	[illegible]	[illegible]
J	ECN 1386	[illegible]	[illegible]	[illegible]





NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND SHARP EDGES

MATERIAL

FINISH WAVETEK PROCESS

DRAWN [illegible] DATE [illegible]

CHECKED [illegible] DATE [illegible]

MFG APPR [illegible] DATE [illegible]

ENG APPR [illegible] DATE [illegible]

SCALE 2:1

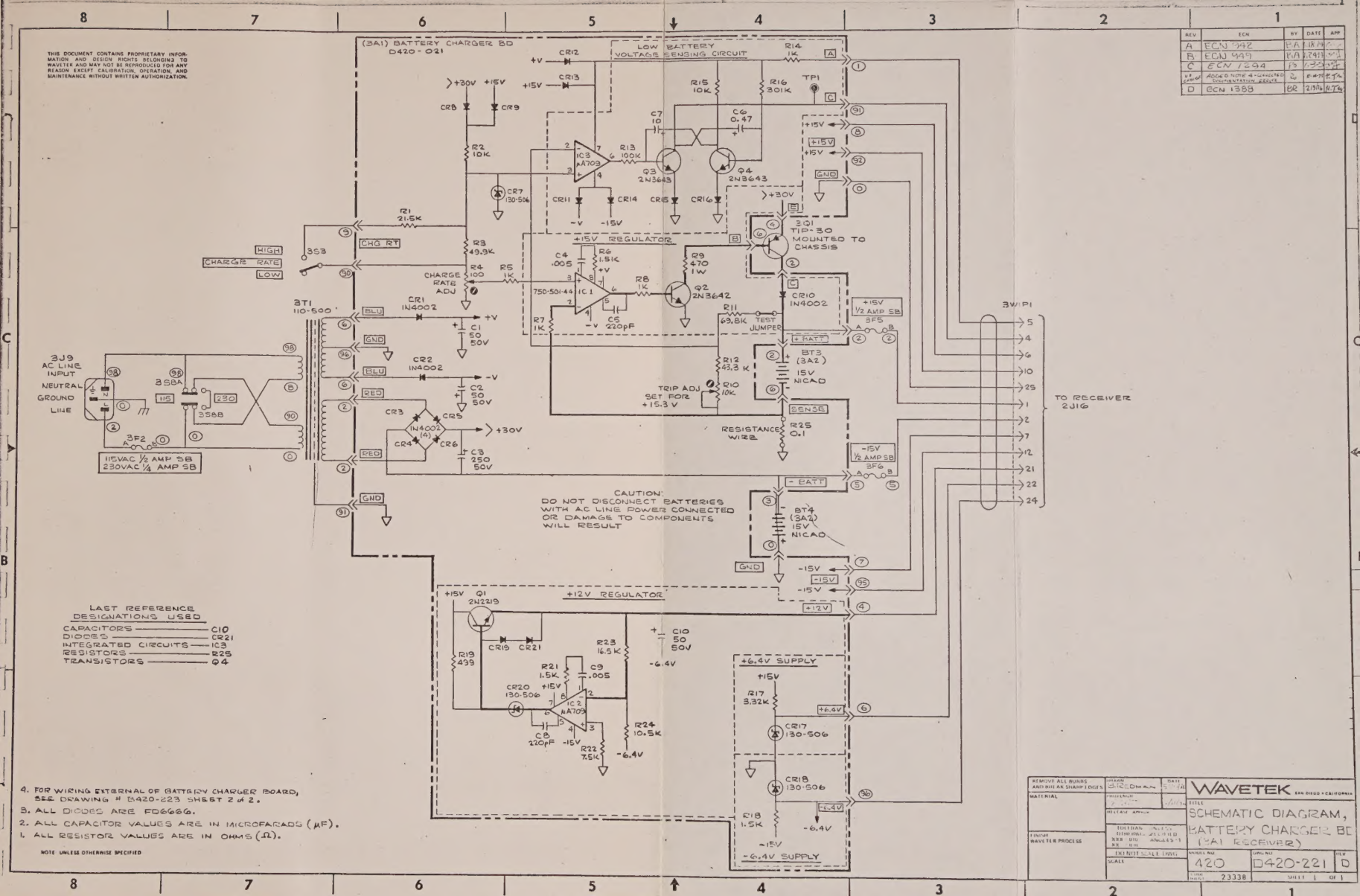
WAVETEK SAN DIEGO, CALIFORNIA

TITLE ASSEMBLY BATTERY CHARGER BD (3A1) RECEIVER

MODEL 420

DRAWING DM420-021 REV J

SIZE D 27338 SHEET 1 OF 2



REV	ECN	BY	DATE	APP
A	ECN 942	PA	1/8/74	
B	ECN 949	PA	2/4/74	
C	ECN 1294	PA	1/23/75	
D	ECN 1388	BR	2/27/76	

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LAST REFERENCE DESIGNATIONS USED

CAPACITORS	C10
DIODES	CR21
INTEGRATED CIRCUITS	IC3
RESISTORS	R25
TRANSISTORS	Q4

4. FOR WIRING EXTERNAL OF BATTERY CHARGER BOARD, SEE DRAWING # B420-223 SHEET 2 of 2.
3. ALL DIODES ARE FD6666.
2. ALL CAPACITOR VALUES ARE IN MICROFARADS (μF).
1. ALL RESISTOR VALUES ARE IN OHMS (Ω).

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND RUN AR SHARP EDGES
MATERIAL
FINISH WAVETEK PROCESS
DRAWN GREENMAN 5/7/74
ENGINEER
MFG APPR
INTERPRET DIMENSIONS AND TOLERANCES PER ANSI Y14.5-1973
DO NOT SCALE PRINT
SCALE

WAVETEK SAN DIEGO, CALIFORNIA

TITLE: SCHEMATIC DIAGRAM, BATTERY CHARGER BD (3A1 RECEIVER)

WAVES NO	DRAWING NO	REV
420	D420-221	D
23338	SHEET 1 OF 1	

MP MASTER
MA35661